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Chicago

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The Poet Speaks

"Conduct," said Poet Laureate Robert Bridges, "lies in the masterful administration of the unforeseen." Students may well ponder this statement as they finger their diplomas, and brace themselves for their first impact with a world that calls regularly for examinations without benefit of makeup or repeat privileges. Success or failure of the individual depends on how well he administers the impending tests and trials.

The above definition applies also to collective conduct. In national affairs, masterful administration of the unforeseen may be expressed by a far-reaching educational program for youth, or training programs in fundamental research. Within our shrinking natural outdoors, it may provide for parks, recreational areas, and unpolluted rivers. It may also provide for conservation of woodlands, not solely for growing trees, but to assure saving our topsoil, minimizing floods and droughts, and meeting the problem of drinking water for future generations, all inextricably bound to wooded areas at headwaters of rivers and lakes. Furthermore, there may be judicious encouragement of industry, and of the arts and sciences, without strangulation of production or creative thought by regimentation and blundering interference. These are but a few examples.

What of industry? Willis R. Whitney, past President of our Society and honorary member, once expressed the thought that Bridges' definition fitted the conduct of any industry that hoped to survive. Administration of the unforeseen depends again on many factors, but diligent attention to research and to the progressive policy this implies covers much of the necessary ground. Whitney felt that a large company ought to expend regularly 1% of its profits for pure scientific research in addition to the development and applied research it regularly supports. This is justified not only as a minimum insurance for the advance of all industry, but an expression of faith in the over-all good provided by creative discovery whether in electrochemistry, physics, biology, or medicine. "I look back," he said later, "and wonder why I aimed so low." Certainly less than 1% of industrial profit is now spent for pure science, indicating by Whitney's proposal that we are still aiming low in administering the unforeseen.

One responsibility industry and Government can discharge in providing for improved conduct of this generation is to increase support of research, not for narrow material aims and near-sighted objectives, but for an expanding higher-reaching level of living that erases doubts, and gives to everyone a better sense of satisfaction with what has been accomplished. This kind of research is called pure research, because it inspires men to reach out of their petty occupations and provides them with one of the keys to the unforeseen.

Current Affairs

Chicago Meeting—October 12–15, 1949

The local committee making the plans for the Chicago meeting in October has provided facilities for holding simultaneous sessions for the presentation of technical papers. The desirability of holding simultaneous sessions in unrelated subjects was demonstrated at Philadelphia, thereby allowing sufficient time for adequate presentation and discussion of papers. The facilities at the La Salle Hotel, the Chicago meeting headquarters, are particularly adapted to such a program.

The Electro-Organic Division under Chairman C. A. Crowley is again presenting a full program of papers. At the present writing a total of 15 papers dealing with various phases of this subject have been submitted, indicating the rapidly growing importance of this phase of electrochemistry. The interest in this Division is world-wide in scope, as evidenced by the contributions to the October symposium. Papers have been contributed by workers in this field in England, Italy, and India. Six of the papers so far listed deal with polarographic studies. Not only will the electro-organic symposium extend over a period of two days, but, in addition, a Round Table discussion is scheduled for Saturday, October 15th.

The Corrosion Division, under the leadership of Chairman M. G. Fontana, will have a full program of papers. Dr. Fontana is laying particular stress upon adequate time for presentation and discussion of the papers. Those interested in this subject may, therefore, look forward to an unhurried program. Included will be papers on a wide variety of subjects. Cohen, in collaboration with Pyke and Marier, will present another paper of a series dealing with the inhibition of corrosion by nitrites. Uhlig and Robertson will present the results of their studies on the "Chemical Properties of the Intermetallic Compounds Mg_2Sn and Mg_2Pb," whereas Streicher is presenting his second paper on "The Dissolution of Aluminum in Sodium Hydroxide Solutions."

The Battery Division, in lieu of holding a session of prepared papers, is ar-

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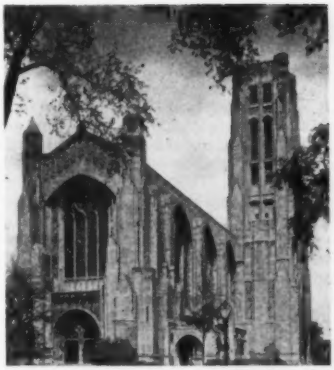
WORLD FAMOUS CHICAGO STOCK YARDS—SHOWING RAW MATERIAL FOR RAPIDLY GROWING "BY-PRODUCT" CHEMICAL AND ELECTROCHEMICAL PROCESSES

ranging for an informal Round Table meeting at which there will be discussed particularly the structures of manganese dioxides as disclosed by the x-ray in an effort to arrive at some uniform designations for the various patterns. Further details will be announced in subsequent issues of the JOURNAL.

The Electrodeposition Division, with R. A. Schaefer as Chairman, is anticipating the usual quota of papers on this subject particularly in view of the importance of Chicago as an electroplating center. Plans are under way to secure the cooperation of the Chicago Section of the American Electroplaters' Society in playing host to the Electrodeposition Division. Some special features are being planned by the local committee for the electrodeposition session on October 15, including a special luncheon with an honor guest. Of particular interest to the members of this Division will be the papers which cover plating on magnesium and aluminum. In addition there will be papers on chrome plating, fused salt cleaning, x-ray method for determining thickness of tin plate, and insoluble anodes in stannate tin baths.

The La Salle Hotel should be a particularly good hotel selection for the October meeting. The local committe chose it as the best of the lot after reviewing the possibilities of a number of hotels. Located at the intersection of La Salle and Madison Streets, it is in the center of downtown Chicago and, more important, it has recently completed a two-million dollar rehabilitation program of which the hotel officials are justly proud. As a result, the La Salle has the most modern facilities—actually a new 1000-room hotel containing six dining rooms and lounges. The 18th and 19th floors, on which the meeting activities will occur, are served by automatic, self leveling, high-speed elevators that provide quick and easy movement from any part of the hotel.



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ROCKEFELLER CHAPEL
UNIVERSITY OF CHICAGO

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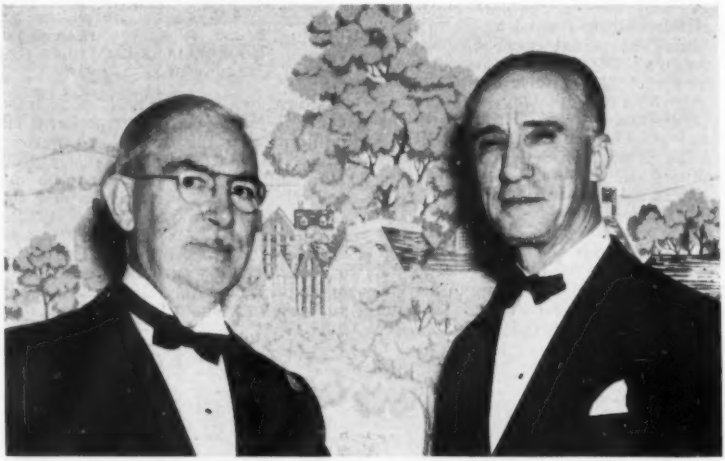
CHICAGO NATURAL HISTORY MUSEUM, ALSO KNOWN AS THE FIELD MUSEUM

Record Attendance at Philadelphia Convention

The ninety-fifth meeting of the Society, held in Philadelphia, May 4th through 7th, was one of the most successful in the Society's history. Over five hundred members and guests attended to take part in the well-arranged symposia on Luminescence, Rare Metals, and Theoretical Electrochemistry. In addition, there was an interesting session composed of papers of general interest. Round-table discussions on "Luminescence," "Materials of Construction for Chlor-Alkali Plants," and "Special Melting Techniques for Metals" completed the technical program, which offered over seventy papers.

Entertainment, as planned by the Philadelphia Committee, was another attractive feature of the meeting. A luncheon on Thursday was well-attended by the many members who were interested in hearing President Lee discuss the present policies and aims of the Society. A group luncheon was held on Friday for the various Divisions; the seating having been so arranged that those attending were able to become better aquainted with the members of their own division. Television sets, radios, a live duck wearing a committee badge, and other valuable prizes attracted many members and guests to the buffet supper and Tombola held on Friday night. Completing the entertainment program were luncheons and trips for the ladies on Thursday and Friday.

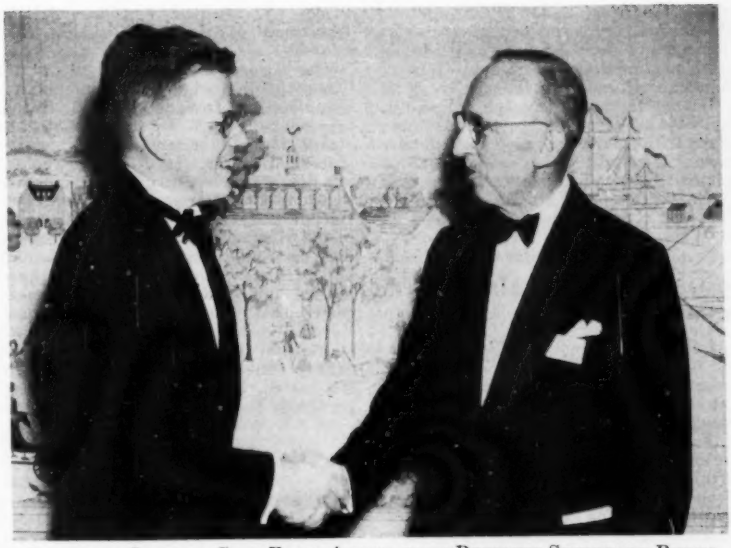
The annual banquet was held on Thursday night, following a reception for President and Mrs. Lee. The banquet featured the award of the Young Author's Prize and the Turner Book Prize to Dr. Michael A. Streicher and Mr. Lee's presidential address entitled "Developments and Trends in the Electrochemical Industry." Dancing and refreshments completed the program for Friday.



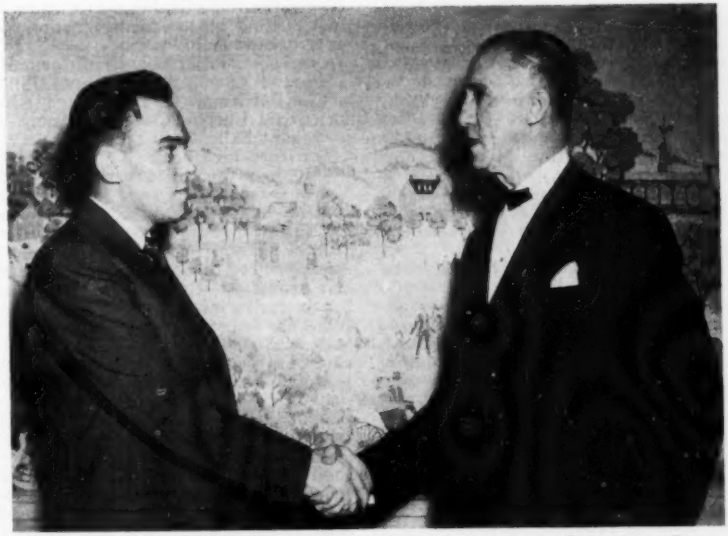
President Ferguson and Past President Lee at Philadelphia Meeting

Still another part of the full program were the plant trips. On Friday morning, a large group visited the plant and laboratories of the Leeds & Northrup Company, and on Friday afternoon, members and guests enjoyed visits to the Whitemarsh Research Laboratories of Pennsylvania Salt Manufacturing Company and the Regional Research Laboratories of the U. S. Department of Agriculture.

The record attendance and success of the technical program was due largely to the efforts of those who solicited papers and planned the program, H. C. Froelich,



SECRETARY LINFORD GETS FINAL ADVICE FROM RETIRING SECRETARY BURNS



MICHAEL A. STREICHER RECEIVES CONGRATULATIONS FROM PRESIDENT LEE

George Glockler, E. G. Widell, and R. M. Burns. Congratulations for the overall success of the meeting are still being extended to Ernest G. Enck, General Chairman; Russell P. Heuer, Chairman of Hotel Reservations; John F. Gall, Chairman of Meeting Accommodations; Edgar L. Eckfeldt, Chairman of Registration; Hiram S. Lukens, Chairman of Finance; Harry A. Alsentzer, Chairman of Entertainment; Milton B. Barba, Chairman of Plant Visits; and Albert A. Ware, Chairman of Publicity.

An Open Letter to Members from the Secretary:

At the annual meeting of the Society, held in Philadelphia May 4-7, 1949, one of the best series of technical sessions that this Society has ever had the privilege of participating in was held.

Since the rank and file of the membership of the Society hear only about the technical sessions, it is my purpose here to report to the membership on all very important actions taken by their Board of Directors on May 4. In general, they deal with matters concerning publication and membership.

At this meeting, the Publication Committee was dissolved and the Publication Board substituted, consisting of H. H. Uhlig, Editor, H. J. Read, Technical Editor, and F. L. LaQue, Business Manager. The Publication Board was charged with the responsibility of publication of the JOURNAL and TRANSACTIONS. They were requested to undertake a study leading to enlarging the format of the JOURNAL and possibly accepting advertising. At the same time, they were instructed to bear in mind that these changes might lead to the discontinuance of the practice of publishing the bound TRANSACTIONS twice a year.

It was understood that the Editorial Staff, as now constituted, would continue, namely, Miss Eleanor Reid, Managing Editor, R. M. Burns, Consultant, and U. B. Thomas and H. B. Linford, Associate Editors. Also, the Publication Board was directed to continue the system of manuscript reviewing, as instigated a few years ago, in which divisional representatives actually handle the mechanics of review.

It should be pointed out that the post of Chairman of the Publication Comittee, according to the Constitution, is a member of the Board of Directors. Therefore, until the Constitution can be revised, the Editor has been named Chairman of the "Publication Committee."

The second major revision involves Constitutional changes of membership classification. In order that our Society may obtain a more favorable professional status, many have felt that full membership should be reserved for electrochemists possessing certain qualifications with regard to education and experience. Under the new Constitution, there would be five membership classifications: active, student associate, associate, sustaining, and honorary members. The qualifications for the various classes of membership are clearly stated in Article II, Section 2, of the proposed Constitution which you will all receive shortly. This Constitutional change cannot go into effect until after the entire membership has had an opportunity to vote.

HENRY B. LINFORD
Secretary

Divisions Report on Philadelphia

Electrothermic Division

The Electrothermic Division held its annual business meeting at 9 A.M., May 7th, at the Philadelphia Convention. At this meeting, officers for the coming year were elected as follows:

Chairman: Julian Glasser, Armour Research Foundation, Chicago, Illinois
Vice-Chairman: C. H. Chappell, National Carbon Company, Inc., Niagara Falls, New York
Secretary-Treasurer: A. E. Pavlish, Battelle Memorial Institute, Columbus, Ohio
Executive Committee: C. P. Zergiebel and A. T. Hinckley

After the election of officers, Dr. Glasser appointed the members of the executive committee who met and made plans for the spring meeting next year. Present plans are to have papers covering a new and vital field which can properly be classed as electrothermics covering a subject matter of new highly refractory compounds.

The special panel session held on May 7th was highly successful and resulted in attendance of about eighty people. Considerable discussion and interest was aroused by this panel session on "Special Melting Techniques." From the standpoint of the Division and the Society itself, it is of interest to note that approxi

mately 57 members were interested in receiving news of the Division. As a result, the usual news letter and questionnaire will be sent to the new people who signified their interest in the panel session.

A. E. PAVLISH, *Secretary-Treasurer*

Electronics Division

At the annual business meeting of the Electronics Division of the Electrochemical Society, held at the Benjamin Franklin Hotel in Philadelphia, May 6th, the following officers of the Division were elected for the ensuing season:

Chairman: H. R. Schoenfeldt, General Electric Company, Cleveland, Ohio
Vice-Chairman: E. F. Lowry, Sylvania Electric Products, Inc., Salem, Massachusetts
Secretary-Treasurer: John R. Musgrave, The Eagle-Picher Company, Joplin, Missouri

At this convention, symposia on "Luminescence" and on "Rare Metals" were conducted as regular activities of the Electronics Division. Forty-seven papers were presented at these two symposia and were the subject of a great deal of interesting discussion. The discussions on certain phases of the subjects were carried over into round table gatherings on Friday afternoon at which informal talks were continued.

The Division plans to hold symposia on each of these topics at the Convention in Cleveland next spring.

ERWIN F. LOWRY, *Secretary-Treasurer*

Industrial Electrolytic Division

Approximately ninety members and guests attended the round table on "Materials of Construction for Chlor-Alkali Plants," sponsored by the Industrial Electrolytic Division, on May 7th, at the Philadelphia Convention. The meeting was opened by Division Chairman R. E. Cushing.

Preceding the regular discussion, R. B. MacMullin presented the report of the Chlor-Alkali Committee for 1948. This report appears in this issue of the JOURNAL, page 21c.

The informal round table discussion dealt with experiences which have been had, problems encountered, and solutions which have been found concerning construction material in the electrolytic chlor-alkali industry. The leaders of the discussion were: W. S. Swisher, Columbia Chemicals Division, Pittsburgh Plate Glass Company, New Martinsville, W. Va.; F. W. Koerker, The Dow Chemical Company, Midland, Mich.; H. O. Teeple, International Nickel Company, Inc., New York; Axel Heilborn, Niagara Alkali Company, Niagara Falls, N. Y.; D. O. Hubbard, Hooker Electrochemical Company, Niagara Falls, N. Y.; W. C. Gardiner, Mathieson Chemical Corporation, Niagara Falls, N. Y.; and W. E. Pratt, Worthington Pump & Machinery Corporation, Harrison, N. J.

* * *

The formal meeting of the Division was held on the afternoon of May 7th, with 22 members attending. The nominating committee presented the following slate of officers for 1949–1950, who were unanimously elected:

Chairman: R. B. MacMullin, R. B. MacMullin Associates, Niagara Falls, New York
Vice-Chairman: A. C. Loonam, Deutsch & Loonam, New York City
Secretary-Treasurer: M. S. Kircher, Hooker Electrochemical Company, Niagara Falls, New York.

It was suggested that Instrumentation Problems relating to Industrial Electrolysis be the topic for a symposium at the Spring 1950 Convention. Considerable interest was expressed and several subjects suggested, indicating that this would be a timely topic. Decision on the topic will be made by the newly-constituted executive committee.

M. S. KIRCHER, *Secretary-Treasurer*

Section News

Pacific Northwest Section

A joint meeting of unusual interest was held on May 28th at the Mallory Hotel, Portland, Oregon, by the Pacific Northwest Section, the Oregon Section of the American Chemical Society, and the Washington-Oregon Section of the American Institute of Chemical Engineers.

The program began at 4 P.M. with an address on "Penicillin" by Dr. Arthur F. Livermore of Reed College, Portland. At 5 o'clock, the Electrochemical Society held its business meeting. This was followed by a social hour at 5:30 and dinner at 6:30.

The technical program was continued at 7:30, featuring a talk by Dr. Earl T. Hayes, Physical Metallurgist, Bureau of Mines, Albany, Oregon. Dr. Hayes chose

as his subject, "Recent Developments in Titanium and Zirconium."

The entire program was well planned, both from a technical and social standpoint, and was enjoyed by all who attended.

JOSEPH SCHULEIN, *Secretary-Treasurer*

San Francisco Section

The May meeting of the San Francisco Section was held on the 18th, at the St. Julien Restaurant, San Francisco.

The officers for the coming season were elected at this meeting and are as follows:

Chairman: Howard B. Richman, The Dow Chemical Company
Vice-Chairman: Edward B. Sanigar, San Francisco Naval Shipyards
Secretary-Treasurer: Richard F. Bechtold, The Dow Chemical Company

The guest speaker for the occasion was Dr. Ralph M. Hunter, Manager of the Electrochemical Division of The Dow Chemical Company, and Vice-President of the Society. Dr. Hunter spoke for a short time about the Society in general and then went into the formal section of his talk which concerned "The Production of Magnesium."

Dr. Hunter stated that the use of magnesium is being developed in three fields: structural, chemical, and electrochemical. Structural use may be illustrated by the part it plays in the construction of aircraft and engines; chemical use by the part it plays in the construction of incendiary bombs and as a deoxidizing agent, and electrochemical use by the part it plays in the field of cathodic protection.

Pre-war rates of magnesium production showed a growth of about 100 per cent every two years. There was practically no scrap return during this time. During the war years (1941–1945) the rate of production increased one hundredfold and surpluses naturally accumulated. At the present time, consumption is returning to normal.

The speaker described the history of magnesium production and the difficulties encountered with the earlier processes. He said work was being done both in Germany and the United States, and the comparisons of the early development work and the conclusions reached proved to be very interesting.

Dr. Hunter then discussed the various methods used for the production of magnesium as they were finally evolved by both the Germans and Americans. The principal methods are electrolytic and are illustrated by the plants of The Dow Chemical Company at Midland, Michigan, and Freeport, Texas, and the Basic Magnesium Corporation at Las Vegas, Nevada. The other processes involve the reduction of magnesium ores with ferrosilicon or carbon. Ferrosilicon plants were operated by New England Lime in Connecticut, National Lead at Luckey, Ohio, Electro-Met at Spokane, Washington, Kaiser at Salinas and Moss Landing, California, Ford at Dearborn, Michigan, and Amco at Wingdale, New York. The carbothermic process was used at the Permanente Metals plant at Permanente, California.

War production figures and economic comparisons of the cost of operation at the various plants during the war were presented.

The talk was illustrated by slides showing early German and American cells and furnaces and also equipment used in the different processes operated during the war.

Dr. Hunter's talk was very well received by all who attended. A great amount of interest was created, as evidenced by the lively discussion period which followed.

R. F. BECHTOLD, *Secretary-Treasurer*

New York Metropolitan Section

The New York Metropolitan Section met for dinner on May 19th at the Holley Hotel, New York City.

Dr. Henry B. Linford, Department of Chemical Engineering, Columbia University and Secretary of the Society, and Dr. Frederick Lowenheim of Metal & Thermit Company, New York, addressed the meeting on the topic, "Electroplating the Uncommon Metals."

Dr. Lowenheim considered briefly groups of the 47 metals not now commercially electroplated. Of this group, antimony had the most commercial promise. Ductility and adhesion were still poor, however. If alloys were to be considered, the tungsten-cobalt deposit might have commercial possibilities.

Dr. Linford discussed indium and cobalt. The latter has not been plated commercially only because it is much more expensive than nickel and has about the same properties. It is used in bright nickel baths and might be used in tungsten plating. Dr. Linford said that indium is still too high priced for anything but the highly specialized uses. The lead-indium bearing was discussed

as the only commercial use so far. Acid and alkaline baths also were covered. An active discussion followed the talks of the speakers.

At the annual business meeting, held prior to the technical session, the following officers were unanimously elected for the coming year:

Chairman: L. I. Gilbertson, Air Reduction Company, Inc.
Vice-Chairman: H. R. Copson, International Nickel Company, Inc.
Secretary-Treasurer: J. S. Mackay, American Cyanamid Company
Executive Committee: A. C. Loonam, Wm. E. Shaw, F. A. Lowenheim

J. S. MACKAY, *Secretary-Treasurer*

Niagara Falls Section

"Unsolved Problems in Electrochemistry" was the title of an address delivered by Dr. Colin G. Fink, honorary member of the Electrochemical Society, at a joint meeting on March 15th of the Niagara Falls Section with the Western New York Section of the American Chemical Society.

In addition to the presentation of a number of unsolved problems, Dr. Fink presented data strongly supporting the viewpoint of periodicity in corrosion processes. Some of the unsolved problems discussed were:

What chemical compound is the seat of the blue color of ultramarine? It is manufactured by heating a mixture of colorless compounds: kaolin, soda ash, sulfur, and carbon. From a technical point of view, finding the process by which the blue color is produced may suggest the development of other pigments, such as turkey red or pure yellow for which there is a constant demand.

Calcium cyanamid is made by interacting calcium carbide with nitrogen at about 1000 C. The by-product is finely divided graphite. Can we recover it? If so, how?

How can we produce large crystals of metals from fused electrolytes? Large crystals of metals would serve as ideal starting materials for sheet, strip, and wire. It is probable that the purity of these large crystals will excell that of the fine crystals.

For the alkali chlorine industry, graphite anodes of 99+ per cent purity are needed made with a binder resistant to chlorine and its compounds.

Electron emitters better than barium, strontium, and thorium are needed. There are so many electron emitting metals available today that research along alloy lines should be very promising. Alloys of lithium and rubidium should be investigated. One of the advantages due to rare metal developments is that it is possible to use foundation metals, such as tantalum, columbium, zirconium, etc., and apply the new emitter onto the surface of these metals, preferably in wire form. Another approach is to consider a number of metals that have not been included in previous researches.

How can we make beryllium and chromium ductile? Tungsten belongs to the same periodic group as chromium

COLIN G. FINK

and it might very well be that making chromium ductile is very similar to the problem solved for tungsten. As a hint, Dr. Fink suggested trying out various scavengers and noting the effect on the brittleness of chromium. In the case of tungsten, he pointed out that thorium was one of the best scavengers. Another scavenger was a very small percentage of carbon.

Studies should be made of direct conversion of sun energy into electric energy, and direct conversion of coal into electric energy.

Can we find a substance harder than diamond? According to Dr. Fink, it is not difficult to conceive of the numerous

uses to which a hard substance of this kind could be put. It would take the place of diamond in core drilling and the drilling time would be cut down to a fraction of the time now required.

New applications should be found for zenon and krypton.

Temperatures of 10,000 C should be investigated. According to Dr. Fink, preliminary experiments have been conducted which indicate that at elevated temperatures, such as 10,000 C, substances lose their familiar characteristics. A suggested study is that of reactions occurring in interstellar space.

The talk was enthusiastically received.

* * *

At the April 13th meeting of the Section, held at the Red Coach Inn, the following officers were elected for 1949–1950:

Chairman: R. G. Brown, Comstock & Wescott, Inc., Niagara Falls, New York

Vice-Chairman: M. J. Udy, Niagara Falls, New York

Secretary-Treasurer: M. S. Kircher, Hooker Electrochemical Company, Niagara Falls, New York

Following the business meeting, about 50 members and guests heard a very interesting talk by Dr. E. A. Gee of the Pigments Department, E. I. du Pont de Nemours & Company, Inc., Wilmington, Delaware, on the subject "Titanium, a New Structural Metal."

Excerpts from Dr. Gee's talk are given on page 19c.

M. S. KIRCHER, *Secretary-Treasurer*

Midland Section

The Annual Dinner and Ladies' Night of the Midland Section was held on May 18th at the Midland Country Club, Midland, Michigan. The dinner was well attended by the members and their wives, and favors were presented to the ladies.

Mr. A. T. Look of Plastics Technical Service, The Dow Chemical Company, spoke to the gathering on "Saran Fabrics." The theory of fiber formation was discussed and Mr. Look used slides to illustrate his talk. He reported saran to contain 71 per cent chlorine, and, therefore, it is of special interest to the electrochemical field. He also showed colored slides of manufacturing facilities and had samples of the various fabrics in production, as well as other products. The subject was of interest to all and was well received.

F. W. KOERKER, *Secretary-Treasurer*

Detroit Section

At the meeting of the Detroit Section, held on April 15th, the following officers were elected for the coming year:

Chairman: Chester Borlet, Harshaw Chemical Company

1st Vice-Chairman: Glen Coley, Detroit Edison Company

2nd Vice-Chairman: Henry Brown, Udylite Corporation

Secretary-Treasurer: Miss Margaret L. Baty, Chrysler Corporation, Engineering Laboratories.

Representatives for the Local Section Advisory Council are:

One Year Term: Jesse Stareck, United Chromium, Inc.

Two Year Term: Leland M. Morse, Chrysler Corp., Engineering Laboratories.

Following the business meeting, Mr. Paul Semm, Chief Engineer of the Wheelco Instrument Company, addressed the company on "An Electronic Controlled Follow-Up Mechanism." In his lecture, Mr. Semm discussed the operation and uses of the follow-up mechanism, placing special emphasis on a description of the electronic circuit used in the instrument.

* * *

At the May 20th meeting, held at the Sheraton Hotel, the Detroit Section extended congratulations to Dr. A. L. Ferguson on his election to the presidency of the National Society.

The speaker of the evening on this occasion was Mr. H. A. Humble, Metals Protection Laboratory, Dow Chemical Company. Mr. Humble's subject was "The Use of Magnesium Anodes in the Cathodic Protection of Metallic Structures." He pointed out that magnesium is effective in providing cathodic protection because of its high solution potential, freedom from polarization effect, and high current recovery. The high solution potential makes available one to three times the current available with other commonly used anodes.

Probably the most important cathodic factor which affects the efficacy of cathodic protection is the composition of the electrolyte, particularly its ability to form calcareous coatings. The calcareous coatings act as barriers to oxygen and other depolarizers, increase the pH

adjacent to the cathode, and add resistance to the internal circuit.

Mr. Humble discussed the tests which had been run in sea water to study the action of magnesium in protecting, both under water and in the splash area which is exposed alternately to sea water and air. Magnesium anodes are very effective in protecting against under-water corrosion, but are not too effective in protecting the splash area.

The speaker also discussed tests which had been made using magnesium anodes to protect galvanized hot water tanks. Magnesium is effective with most waters, but is not too efficient in localities where the water is extremely soft. The failure of the magnesium under these circumstances is accompanied by a reversible in potential difference relationships between magnesium and zinc.

A discussion period followed Mr. Humble's talk, during which the use of magnesium anodes in protecting underground pipelines was reviewed.

M. L. BATY, *Secretary-Treasurer*

Meeting of Scientific Research Institute

The Institute on Administration of Scientific Research and Development was presented by The American University with the cooperation of the National Research Council and the American Association for the Advancement of Science, in Washington, D. C., on June 6th to 10th.

The objective of the Institute is to present advanced thinking and practice in the administration of research and its application. The program for June devoted its sessions to five major topics, namely, (1) Research Organization, (2) Administrative Process in the Research Organization, (3) Research Personnel, (4) Aids to Research, (5) Research Product.

New Generator at Grand Coulee

The tenth main generator at Grand Coulee Dam was placed in commercial service when the President pressed a gold key at the White House at 3 P.M. on May 20th, thus giving Grand Coulee the largest rated power producing capacity of any plant in the world. An electrical impulse from the President's gold key flashed to the dam, via Western Union Telegraph lines, and set in motion machinery that placed the generator's output onto lines serving the Pacific Northwest.

Grand Coulee Dam is the principal feature of the $785,000,000 Columbia Basin project which is being built to develop irrigation, hydroelectric power, and related resources for the Pacific Northwest. Installation of the new generator marks another milestone of progress in this development.

Marden Prize Winner

John D. Mosser of Abingdon, Illinois, has been named the recipient of the John W. Marden Prize for 1949. This award

JOHN D. MOSSER

entitles the winner to one year's subscription to the publications of The Electrochemical Society, and is made to the outstanding graduating student in chemical engineering at Illinois Wesleyan University, Bloomington, Illinois.

Born July 9, 1923, in Abingdon, Illinois, John Mosser received his early education in the schools of that city. Later, he attended Knox College, Galesburg, Illinois, and Oberlin College at Oberlin, Ohio. In 1943 he entered the U. S. Army where he served until 1946. After his release from the Army, Mr. Mosser entered Illinois Wesleyan University, graduating in June, 1949.

Instrument Exhibit September 12–16

The Fourth National Instrument Conference and Exhibit, sponsored by the Instrument Society of America, will be held at the Municipal Auditorium, St. Louis, Missouri, on September 12th to 16th.

Over ninety manufacturers of instruments and devices have reserved space to show their latest developments. Exhibits will include scientific and industrial instruments and devices for measurement, inspection, testing, and control. About 10,000 visitors are expected to attend the exhibit.

Technical sessions will be held in the Auditorium by the Instrument Society of America, American Institute of Physics, Industrial Instruments and Regulators Division of the American Society of Mechanical Engineers, the Instruments and Measurements Committee of the American Institute of Electrical Engineers, the Institute of Radio Engineers, the American Institute of Chemical Engineers, and the National Telemetering Forum.

Future Meetings of Other Organizations

Illuminating Engineering Society, national technical conference, French Lick, Indiana, September 19–23.

American Standards Association, annual meeting, Waldorf-Astoria Hotel, New York City, October 11–14.

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Future Meetings of The Electrochemical Society

Chicago, October 12-15, 1949

Cleveland, April 19-22, 1950

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St. Louis, Spring, 1951

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R. M. Burns Heads New York Chemists

R. M. Burns, Chemical Director of the Bell Telephone Laboratories, Murray Hill, New Jersey, has been elected Chairman of the New York Section of the American Chemical Society for the year beginning July 1st, 1949. He has also recently been appointed a member of the Advisory Committee to the Research Division of the New York University College of Engineering.

R. M. Burns

Dr. Burns is well known to the members of The Electrochemical Society. He has long been active in Society affairs and has the distinction of being the only man to have held the offices of Secretary, Treasurer, and President. He was Treasurer from 1931 until 1943, when he was elected President, and was Secretary from July, 1947, until May, 1949. He is now serving as Consultant to the newly-organized Publication Board. Dr. Burns has been a member of the Society since 1922.

Personals

Otto Kay, previously residing in Syracuse, New York, has accepted a position with the Armour Research Foundation, Chicago, Illinois.

H. J. Butterill has been appointed Chief Design Engineer of the Canadian

Armament Research and Development Establishment at Quebec City, P. Q., Canada.

R. L. BALDWIN has joined the Hardinge Company, Inc., San Francisco, California in a sales development capacity. Mr. Baldwin is well known in the Society of which he is a former president.

FRANK L. JONES, for many years with the Bausch & Lomb Optical Company, Rochester, New York, is now residing in Aspinwall, Pittsburgh, Pa.

James Lee Takes New Position in Texas

James A. Lee, Past President of The Electrochemical Society and former managing editor of "Chemical Engineering," 330 West 42nd Street, New York, became

JAMES A. LEE

head of McGraw-Hill Publishing Company's news bureau at Houston, Texas, on July 1st. Mr. Lee will also serve as southwestern editor for "Chemical Engineering."

Mr. Lee has been a very active member in the Society during the past years, having served as Chairman of the Membership Committee, Vice-President, and President, respectively. It is hoped that his appearances at future Society meetings will not be too infrequent, despite the distance of the new location.

Letters to the Editor

Regimentation

Dear Sir:

This letter concerns your editorial in the April number of the JOURNAL which I am sending to a member of Congress as an example of the state of mind of the majority of scientific and technical men. The intention of the present administration (supported by an extremely vocal minority) to invest our money for us via taxation, to plan our industrial future, and, in general, to live our lives for us seems to me to call for less muttering in our respective beards and more communication of our opinions to our elected representatives.

I should like very much to see, in the next number of the JOURNAL, an editorial urging that every member write to his representatives in Congress on this matter. The scientific and technical men certainly constitute one of the soundest and best-balanced groups of citizens in the country, and, from my contacts, resent deeply any moves toward regimentation. Yet, they make almost no effort to influence political action at a time when freedom of personal action appears in real danger of severe restriction.

B. A. ROGERS
Ames, Iowa

Emeritus Membership

Dear Sir:

I take it that Dr. Winship's letter on dues-exempt members in the May JOURNAL was published as a trial balloon. If so, I want to say a word for the continuance of the principle of exemption after a member of long standing has reached retirement age. Thirty years' membership is too little in comparison with the rules of sister societies and the age of 65 is arguable, but at 35 years and some age I think the practice should not only be continued, but automatically applied without request.

Many of our best minds are owned by those on college faculties who in time will be retired on modest pensions and generally belong to several societies. Without exemption, many resignations will be inevitable and undesirable. I noted an item in the bulletin of the ASTM (which has no exemption rule) the other day deploring such resignations by some very well-known men.

As to finances, all treasurers are sweeping the corners nowadays, but I am surprised to learn that "relatively large numbers" are over 65; if so, we should hustle for some younger blood. Also, changing 30 years to 35 would cancel many cases. Finally, a resigned member pays no dues and the expense of carrying a deadhead, now that registration fees are charged at meetings, is but the cost of the added copies in the printing order for the JOURNAL.

LAWRENCE ADDICKS
Bel Air, Maryland

Lectures and Fellowships

Dear Sir:

The stature achieved by The Electrochemical Society in recent years has been evidenced by the growth in membership, the improvement in publications, and increased prestige among the recognized technical organizations, both on a local and national basis. This letter is written to suggest a means of making further progress.

The general knowledge of the electrochemical field is by no means commensurate with the size and importance of the latter in scientific and industrial activity. It would seem, therefore, that a desirable function of The Electrochemical Society would be to disseminate pertinent information regarding electrochemistry and to stimulate interest in electrochemistry at the leading universities and technical centers. Such a course should encourage more students to enter this field, as well as inform those working in allied fields.

Sponsored fellowships have been suggested during the past. Fellowships would benefit few other than the recipients, and would do little to achieve the desired goal of increased facilities for teaching electrochemistry and the training of a large number of electrochemists.

A suggested alternative is the sponsoring of a series of lectures at leading universities and technical centers. These lectures could and should be presented by members of the society engaged in actual research or industrial operations. It is believed that the following advantages would accrue:

1. The size and importance of the electrochemical field would become more generally known.
2. Recognition of the importance of electrochemistry would encourage universities to expand instruction in this field.
3. Students would be attracted to this field, thereby making more trained men available for electrochemical work.
4. The Society, as well as the company represented by the lecturer, would obtain desirable publicity.

It is possible that the execution of this plan could be the responsibility, at least in part, of the local sections. It would be desirable to obtain a representative speaker from each of the technical divisions of the society, this for the following reasons:

1. Particularly active fields (e.g., corrosion) are likely to attract new men.
2. The groups at which the proposed lectures would be aimed would have their attention directed to the broader aspects of electrochemistry rather than the narrower fields of interests, covered by such specialized groups as The Corrosion Engineers, The Electroplaters' Society, The Metal Powder Association, etc.
3. The selection of a speaker from each technical division of the Society would enable the presentation of a coordinated sequence of lectures.

The foregoing suggestions have been made to present a manner in which the objectives and growth of The Electrochemical Society can be furthered with concrete benefit to industrial electrochemical endeavor.

J. PAUL OLIVER
Fostoria, Ohio

Sections, Divisions, and Industry take note! Perhaps we should encourage lectures and *fellowships since successful lectures depend, in part, on the virile fundamental investigations provided by the right kind of support.*—Ed.

New Members

At the meeting of the Board of Directors held on May 4th, 1949, at the Benjamin Franklin Hotel, Philadelphia, the following were elected to membership:

ERIC A. ARNOLD, mailing add: Case Institute of Technology, Cleveland 6, Ohio (Electronics)

STRATFORD B. BIDDLE, JR., mailing add: Leeds & Northrup Company, 1095 Market Street, San Francisco 3, California (Industrial Electrolytic)

MYRON T. CORY, mailing add: Great Lakes Carbon Corporation, Niagara Falls, New York (Alkali and Chlorine, and Electrodeposition)

DOUGLAS DOW, mailing add: The Detroit Testing Laboratory, 554 Bagley Avenue, Detroit 26, Michigan (Battery, Corrosion, Electrodeposition, and Theoretical Electrochemistry)

J. H. GUMZ, mailing add: Pacific Gas & Electric Company, 245 Market Street, San Francisco 6, California (Electrothermic and Industrial Electrolytic)

ROSS HARE, E. I. du Pont de Nemours & Company, Inc., mailing add: 621 Vanderbilt Avenue, Niagara Falls, New York (Industrial Electrolytic)

V. W. HATCHETT, Socony Vacuum Oil Company, mailing add: 117 Main Street, Augusta, Kansas (Corrosion, Theoretical Electrochemistry, and Electronics)

FREDERICK E. HERSTEIN, General Ceramics & Steatite Corporation, mailing add: 812 Carlton Avenue, Plainfield, New Jersey (Corrosion and Industrial Electrolytic)

THOMAS LAKEN, The Parker Pen Company, mailing add: 759 So. Fremont Street, Janesville, Wisconsin (Electrodeposition)

ROBERT J. LAW, mailing add: International Nickel Company of Canada, Ltd., 25 King Street W., Toronto, Ontario, Canada (Corrosion)

RAYMOND F. LEDFORD, mailing add: Hanson-Van Winkle-Munning Company, 2920 Carroll Avenue, Chicago, Illinois (Electrodeposition)

FELIX B. LITTON, Foote Mineral Company, mailing add: 4017 Brunswick Avenue, Drexel Hill, Pennsylvania (Electrodeposition and Theoretical Electrochemistry)

JAMES J. MCINTYRE, E. I. du Pont de Nemours & Company, mailing add: Hillside Drive, Lewiston, New York (Industrial Electrolytic)

MATAM P. MURTI, mailing add: Department of Chemical Engineering, Case Institute of Technology, Cleveland 6, Ohio (Corrosion, Electrodeposition, Theoretical Electrochemistry, and Industrial Electrolytic)

S. C. OGBURN, JR., mailing add: Foote Mineral Company, 4041 Ridge Avenue, Philadelphia 29, Pennsylvania (Corrosion, Electrodeposition, and Electrothermics)

ALEXANDER R. ORBAN, mailing add: Niagara Alkali Company, P.O. Box 352, Niagara Falls, New York (Industrial Electrolytic)

CHARLES H. ORR, The Ohio State University, mailing add: 581 Eastmoor Blvd., Columbus 9, Ohio (Electrodeposition and Theoretical Electrochemistry)

LAUREL E. PUTMAN, Engineer Research & Development Laboratories, Ft. Belvoir, mailing add: P.O. Box 964, Alexandria, Virginia (Theoretical Electrochemistry)

WILLIAM D. ROBERTSON, mailing add: Institute for Study of Metals, 5641 Ellis Avenue, Chicago 37, Illinois (Corrosion and Theoretical Electrochemistry)

RICHARD S. ROBINSON, A. D. Little, Inc., mailing add: 515 Summer Street, Magnolia Station, Gloucester, Massachusetts (Industrial Electrolytic)

SAMUEL T. RUSSELL, mailing add: Blaw-Knox Company, 342 Madison Avenue, New York, New York (Theoretical Electrochemistry and Alkali and Chlorine)

FRANK SOLOMON, Yardeny Electric Company, mailing add: 555 W. 156 Street, New York 32, New York (Battery)

GUNNAR D. STENDAHL, American Smelting & Refining Company, mailing add: Box 382, Avenel, New Jersey (Theoretical Electrochemistry, Batteries, Corrosion, and Electrodeposition)

Employment Situations

Please address replies to box shown, c/o The Electrochemical Society, Inc., 235 W. 102nd St., New York 25, N. Y.

Positions Wanted

RECENT, PH.D. in Chemical Engineering, Johns Hopkins University, desires position specializing in research or development work. Two years' chemical engineering experience with Chemical Warfare Service prior to receiving doctorate degree. *Reply to Box 330.*

METALLURGIST, research and development experience in application of electrolytic leaching and furnace methods to production and refining of non-ferrous metals including copper, lead, zinc, tin, cadmium. College degree. *Reply to Box 331.*

POWDER METALLURGIST, production, development and research. Nine years' experience platinum and precious metal powder alloys. Fifteen years' production and quality control in tungsten and molybdenum refractory metal products. Graduate course in powder metallurgy. B.S. Sc. in chemical engineering, University of Toronto, 1923. *Reply to Box 332.*

Positions Available

METALLURGIST, for research on various phases of the electrolytic reduction of aluminum. Prefer advanced degree in physical chemistry or electrochemistry and/or five years' industrial experience. Location Washington. *Reply to Box A-211.*

ELECTROCHEMIST: A progressive organization requires either an electrochemist or a chemical engineer who has experience with graphite anodes in the caustic chlorine field. Must be capable of performing development and sales service. *Reply to Box A-212.*

ELECTROCHEMIST, B.S. or M.S., two years' industrial experience or more, age up to 30, for research and development work on storage batteries. Please submit résumé with salary desired. *Reply to Box A-213.*

ELECTROCHEMIST for research. Salary range is from $3,000 to $7,000 a year, depending upon qualifications. Location —Washington, D. C. *Reply to Box A-214.*

Recent Patents

Selected for electrochemists by Fred. W. Dodson, Chairman of the Patent Committee, from the Official Gazette.

March 1, 1949

Cary, H. H., and Baxter, W. P., 2,462,843, Glass Electrode.
Keller, F. R., 2,462,870, Electrodeposition of Copper.
Mandel, H. J., 2,462,880, Primary Cell of the Lead-Zinc Type.
Newman, M., 2,462,890, Electrostatic Precipitator System.
Sauerborn, E. P., 2,462,906, Manufacture of Metal Contact Rectifiers.
Skinker, M. F., 2,462,911, Rectifier.
Stateman, M. J., 2,462,917, Method of Manufacturing Rectifier Elements.
de Boer, F., 2,462,949, Method of Treating Selenium.
Hogaboom, G. B., Jr., and Hall, N. R., 2,462,968, Anode.
Ruben, S., 2,462,998, Primary Cell with Permanganate Depolarizer.
Kellogg, G. W., 2,463,039, Electroplating Copper Containing Coating.
Deibel, C. P., deceased, 2,463,089, Flat Dry Cell Battery Unit.
Lundbye, A. E., 2,463,190. Method of Producing Nickel Powder from Printing Press Plates and the Like.
Eduards, M. A., and Garr, D. E., 2,463,254, Electroplating Control System.
Ruben, S., 2,463,316, Alkaline Dry Cell with Permanganate Cathode.
Fink, C. G., and Chuk Ching Ma, 2,463,367, Method of Producing Tungsten.
Nachtman, J. S., 2,463,412, Electric Resistance Heat-Treating of Electroplated Coatings.
Williams, F. E., 2,463,449, Cadmium Pyrophosphate Phosphor.
Birdsall, C. G., 2,463,454, Dry Cell Battery.
Frasch, J., also known as Freud, H. M., 2,463,483, Protection of Metallic Objects by Galvanic Action.

March 8, 1949

Ruben, S., 2,463,565, Dry Primary Cell.
Lee, W. H., and Smith, E. D., 2,463,702, Battery Charger.
Nagle, P. I., 2,463,711, Electrolytic Method of Etching Metals with Stencils.
Veenemans, C. F., and Loosjes, R., 2,463,727, Process of Manufacturing Cathodes for Electric Discharge Tubes.
Albaugh, F. W., 2,463,733, Well Logging.
Dekker, A. J., 2,463,753, Process of Preparing Selenium for the Purpose of Increasing Its Conductivity.
Borden, P. A., 2,463,944, Constant Potential Source of the Thermocouple Type.
Upton, R. C., 2,464,008, Continuous Replenishment of Electrodes in Electric Salt Bath Structures.
Addink, N. W. H., Boucher, C. L., de Lange, C., and Kramer, J., 2,464,066, Method of Reducing the Leakage Current in Selenium Rectifiers.
Jacobson, M. G., 2,464,087, Method for Determining Oxygen in Gases.
Balke, C. W., 2,464,168, Electrolytic Iron for Powder Metallurgy Purposes.

March 15, 1949

Short, A. M., 2,464,267, Dehydrating Alumina in the Production of Aluminum.
Petersen, P. E., 2,464,714, Intermittent Discharge Induction Melting Furnace.
Reiff, O. M., and Moore, A. M., 2,464,769, Separating Alkyl Benzenes from Admixture with Paraffins and Naphthenes.

March 22, 1949

Buser, J. S., 2,464,846, Method of Testing Plating Solutions.

as the only commercial use so far. Acid and alkaline baths also were covered. An active discussion followed the talks of the speakers.

At the annual business meeting, held prior to the technical session, the following officers were unanimously elected for the coming year:

Chairman: L. I. Gilbertson, Air Reduction Company, Inc.
Vice-Chairman: H. R. Copson, International Nickel Company, Inc.
Secretary-Treasurer: J. S. Mackay, American Cyanamid Company
Executive Committee: A. C. Loonam, Wm. E. Shaw, F. A. Lowenheim

J. S. MACKAY, *Secretary-Treasurer*

Niagara Falls Section

"Unsolved Problems in Electrochemistry" was the title of an address delivered by Dr. Colin G. Fink, honorary member of the Electrochemical Society, at a joint meeting on March 15th of the Niagara Falls Section with the Western New York Section of the American Chemical Society.

In addition to the presentation of a number of unsolved problems, Dr. Fink presented data strongly supporting the viewpoint of periodicity in corrosion processes. Some of the unsolved problems discussed were:

What chemical compound is the seat of the blue color of ultramarine? It is manufactured by heating a mixture of colorless compounds: kaolin, soda ash, sulfur, and carbon. From a technical point of view, finding the process by which the blue color is produced may suggest the development of other pigments, such as turkey red or pure yellow for which there is a constant demand.

Calcium cyanamid is made by interacting calcium carbide with nitrogen at about 1000 C. The by-product is finely divided graphite. Can we recover it? If so, how?

How can we produce large crystals of metals from fused electrolytes? Large crystals of metals would serve as ideal starting materials for sheet, strip, and wire. It is probable that the purity of these large crystals will excell that of the fine crystals.

For the alkali chlorine industry, graphite anodes of 99+ per cent purity are needed made with a binder resistant to chlorine and its compounds.

Electron emitters better than barium, strontium, and thorium are needed. There are so many electron emitting metals available today that research along alloy lines should be very promising. Alloys of lithium and rubidium should be investigated. One of the advantages due to rare metal developments is that it is possible to use foundation metals, such as tantalum, columbium, zirconium, etc., and apply the new emitter onto the surface of these metals, preferably in wire form. Another approach is to consider a number of metals that have not been included in previous researches.

How can we make beryllium and chromium ductile? Tungsten belongs to the same periodic group as chromium

COLIN G. FINK

and it might very well be that making chromium ductile is very similar to the problem solved for tungsten. As a hint, Dr. Fink suggested trying out various scavengers and noting the effect on the brittleness of chromium. In the case of tungsten, he pointed out that thorium was one of the best scavengers. Another scavenger was a very small percentage of carbon.

Studies should be made of direct conversion of sun energy into electric energy, and direct conversion of coal into electric energy.

Can we find a substance harder than diamond? According to Dr. Fink, it is not difficult to conceive of the numerous

uses to which a hard substance of this kind could be put. It would take the place of diamond in core drilling and the drilling time would be cut down to a fraction of the time now required.

New applications should be found for zenon and krypton.

Temperatures of 10,000 C should be investigated. According to Dr. Fink, preliminary experiments have been conducted which indicate that at elevated temperatures, such as 10,000 C, substances lose their familiar characteristics. A suggested study is that of reactions occurring in interstellar space.

The talk was enthusiastically received.

* * *

At the April 13th meeting of the Section, held at the Red Coach Inn, the following officers were elected for 1949–1950:

Chairman: R. G. Brown, Comstock & Wescott, Inc., Niagara Falls, New York
Vice-Chairman: M. J. Udy, Niagara Falls, New York
Secretary-Treasurer: M. S. Kircher, Hooker Electrochemical Company, Niagara Falls, New York

Following the business meeting, about 50 members and guests heard a very interesting talk by Dr. E. A. Gee of the Pigments Department, E. I. du Pont de Nemours & Company, Inc., Wilmington, Delaware, on the subject "Titanium, a New Structural Metal."

Excerpts from Dr. Gee's talk are given on page 19c.

M. S. KIRCHER, *Secretary-Treasurer*

Midland Section

The Annual Dinner and Ladies' Night of the Midland Section was held on May 18th at the Midland Country Club, Midland, Michigan. The dinner was well attended by the members and their wives, and favors were presented to the ladies.

Mr. A. T. Look of Plastics Technical Service, The Dow Chemical Company, spoke to the gathering on "Saran Fabrics." The theory of fiber formation was discussed and Mr. Look used slides to illustrate his talk. He reported saran to contain 71 per cent chlorine, and, therefore, it is of special interest to the electrochemical field. He also showed colored slides of manufacturing facilities and had samples of the various fabrics in production, as well as other products. The subject was of interest to all and was well received.

F. W. KOERKER, *Secretary-Treasurer*

Detroit Section

At the meeting of the Detroit Section, held on April 15th, the following officers were elected for the coming year:

Chairman: Chester Borlet, Harshaw Chemical Company
1st Vice-Chairman: Glen Coley, Detroit Edison Company
2nd Vice-Chairman: Henry Brown, Udylite Corporation
Secretary-Treasurer: Miss Margaret L. Baty, Chrysler Corporation, Engineering Laboratories.

Representatives for the Local Section Advisory Council are:

One Year Term: Jesse Stareck, United Chromium, Inc.
Two Year Term: Leland M. Morse, Chrysler Corp., Engineering Laboratories.

Following the business meeting, Mr. Paul Semm, Chief Engineer of the Wheelco Instrument Company, addressed the company on "An Electronic Controlled Follow-Up Mechanism." In his lecture, Mr. Semm discussed the operation and uses of the follow-up mechanism, placing special emphasis on a description of the electronic circuit used in the instrument.

* * *

At the May 20th meeting, held at the Sheraton Hotel, the Detroit Section extended congratulations to Dr. A. L. Ferguson on his election to the presidency of the National Society.

The speaker of the evening on this occasion was Mr. H. A. Humble, Metals Protection Laboratory, Dow Chemical Company. Mr. Humble's subject was "The Use of Magnesium Anodes in the Cathodic Protection of Metallic Structures." He pointed out that magnesium is effective in providing cathodic protection because of its high solution potential, freedom from polarization effect, and high current recovery. The high solution potential makes available one to three times the current available with other commonly used anodes.

Probably the most important cathodic factor which affects the efficacy of cathodic protection is the composition of the electrolyte, particularly its ability to form calcareous coatings. The calcareous coatings act as barriers to oxygen and other depolarizers, increase the pH

adjacent to the cathode, and add resistance to the internal circuit.

Mr. Humble discussed the tests which had been run in sea water to study the action of magnesium in protecting, both under water and in the splash area which is exposed alternately to sea water and air. Magnesium anodes are very effective in protecting against under-water corrosion, but are not too effective in protecting the splash area.

The speaker also discussed tests which had been made using magnesium anodes to protect galvanized hot water tanks. Magnesium is effective with most waters, but is not too efficient in localities where the water is extremely soft. The failure of the magnesium under these circumstances is accompanied by a reversible in potential difference relationships between magnesium and zinc.

A discussion period followed Mr. Humble's talk, during which the use of magnesium anodes in protecting underground pipelines was reviewed.

M. L. BATY, *Secretary-Treasurer*

Meeting of Scientific Research Institute

The Institute on Administration of Scientific Research and Development was presented by The American University with the cooperation of the National Research Council and the American Association for the Advancement of Science, in Washington, D. C., on June 6th to 10th.

The objective of the Institute is to present advanced thinking and practice in the administration of research and its application. The program for June devoted its sessions to five major topics, namely, (1) Research Organization, (2) Administrative Process in the Research Organization, (3) Research Personnel, (4) Aids to Research, (5) Research Product.

New Generator at Grand Coulee

The tenth main generator at Grand Coulee Dam was placed in commercial service when the President pressed a gold key at the White House at 3 P.M. on May 20th, thus giving Grand Coulee the largest rated power producing capacity of any plant in the world. An electrical impulse from the President's gold key flashed to the dam, via Western Union Telegraph lines, and set in motion machinery that placed the generator's output onto lines serving the Pacific Northwest.

Grand Coulee Dam is the principal feature of the $785,000,000 Columbia Basin project which is being built to develop irrigation, hydroelectric power, and related resources for the Pacific Northwest. Installation of the new generator marks another milestone of progress in this development.

Marden Prize Winner

John D. Mosser of Abingdon, Illinois, has been named the recipient of the John W. Marden Prize for 1949. This award

JOHN D. MOSSER

entitles the winner to one year's subscription to the publications of The Electrochemical Society, and is made to the outstanding graduating student in chemical engineering at Illinois Wesleyan University, Bloomington, Illinois.

Born July 9, 1923, in Abingdon, Illinois, John Mosser received his early education in the schools of that city. Later, he attended Knox College, Galesburg, Illinois, and Oberlin College at Oberlin, Ohio. In 1943 he entered the U. S. Army where he served until 1946. After his release from the Army, Mr. Mosser entered Illinois Wesleyan University, graduating in June, 1949.

Instrument Exhibit September 12–16

The Fourth National Instrument Conference and Exhibit, sponsored by the Instrument Society of America, will be held at the Municipal Auditorium, St. Louis, Missouri, on September 12th to 16th.

Over ninety manufacturers of instruments and devices have reserved space to show their latest developments. Exhibits will include scientific and industrial instruments and devices for measurement, inspection, testing, and control. About 10,000 visitors are expected to attend the exhibit.

Technical sessions will be held in the Auditorium by the Instrument Society of America, American Institute of Physics, Industrial Instruments and Regulators Division of the American Society of Mechanical Engineers, the Instruments and Measurements Committee of the American Institute of Electrical Engineers, the Institute of Radio Engineers, the American Institute of Chemical Engineers, and the National Telemetering Forum.

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R. M. Burns

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JAMES A. LEE

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Mr. Lee has been a very active member in the Society during the past years, having served as Chairman of the Membership Committee, Vice-President, and President, respectively. It is hoped that his appearances at future Society meetings will not be too infrequent, despite the distance of the new location.

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B. A. ROGERS
Ames, Iowa

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LAWRENCE ADDICKS
Bel Air, Maryland

Lectures and Fellowships

Dear Sir:

The stature achieved by The Electrochemical Society in recent years has been evidenced by the growth in membership, the improvement in publications, and increased prestige among the recognized technical organizations, both on a local and national basis. This letter is written to suggest a means of making further progress.

The general knowledge of the electrochemical field is by no means commensurate with the size and importance of the latter in scientific and industrial activity. It would seem, therefore, that a desirable function of The Electrochemical Society would be to disseminate pertinent information regarding electrochemistry and to stimulate interest in electrochemistry at the leading universities and technical centers. Such a course should encourage more students to enter this field, as well as inform those working in allied fields.

Sponsored fellowships have been suggested during the past. Fellowships would benefit few other than the recipients, and would do little to achieve the desired goal of increased facilities for teaching electrochemistry and the training of a large number of electrochemists.

A suggested alternative is the sponsoring of a series of lectures at leading universities and technical centers. These lectures could and should be presented by members of the society engaged in actual research or industrial operations. It is believed that the following advantages would accrue:

1. The size and importance of the electrochemical field would become more generally known.
2. Recognition of the importance of electrochemistry would encourage universities to expand instruction in this field.
3. Students would be attracted to this field, thereby making more trained men available for electrochemical work.
4. The Society, as well as the company represented by the lecturer, would obtain desirable publicity.

It is possible that the execution of this plan could be the responsibility, at least in part, of the local sections. It would be desirable to obtain a representative speaker from each of the technical divisions of the society, this for the following reasons:

1. Particularly active fields (e.g., corrosion) are likely to attract new men.
2. The groups at which the proposed lectures would be aimed would have their attention directed to the broader aspects of electrochemistry rather than the narrower fields of interests, covered by such specialized groups as The Corrosion Engineers, The Electroplaters' Society, The Metal Powder Association, etc.
3. The selection of a speaker from each technical division of the Society would enable the presentation of a coordinated sequence of lectures.

The foregoing suggestions have been made to present a manner in which the objectives and growth of The Electrochemical Society can be furthered with concrete benefit to industrial electrochemical endeavor.

J. PAUL OLIVER
Fostoria, Ohio

Sections, Divisions, and Industry take note! Perhaps we should encourage lectures and fellowships since successful lectures depend, in part, on the virile fundamental investigations provided by the right kind of support.—Ed.

New Members

At the meeting of the Board of Directors held on May 4th, 1949, at the Benjamin Franklin Hotel, Philadelphia, the following were elected to membership:

ERIC A. ARNOLD, mailing add: Case Institute of Technology, Cleveland 6, Ohio (Electronics)

STRATFORD B. BIDDLE, JR., mailing add: Leeds & Northrup Company, 1095 Market Street, San Francisco 3, California (Industrial Electrolytic)

MYRON T. CORY, mailing add: Great Lakes Carbon Corporation, Niagara Falls, New York (Alkali and Chlorine, and Electrodeposition)

DOUGLAS DOW, mailing add: The Detroit Testing Laboratory, 554 Bagley Avenue, Detroit 26, Michigan (Battery, Corrosion, Electrodeposition, and Theoretical Electrochemistry)

J. H. GUMZ, mailing add: Pacific Gas & Electric Company, 245 Market Street, San Francisco 6, California (Electrothermic and Industrial Electrolytic)

ROSS HARE, E. I. du Pont de Nemours & Company, Inc., mailing add: 621 Vanderbilt Avenue, Niagara Falls, New York (Industrial Electrolytic)

V. W. HATCHETT, Socony Vacuum Oil Company, mailing add: 117 Main Street, Augusta, Kansas (Corrosion, Theoretical Electrochemistry, and Electronics)

FREDERICK E. HERSTEIN, General Ceramics & Steatite Corporation, mailing add: 812 Carlton Avenue, Plainfield, New Jersey (Corrosion and Industrial Electrolytic)

THOMAS LAKEN, The Parker Pen Company, mailing add: 759 So. Fremont Street, Janesville, Wisconsin (Electrodeposition)

ROBERT J. LAW, mailing add: International Nickel Company of Canada, Ltd., 25 King Street W., Toronto, Ontario, Canada (Corrosion)

RAYMOND F. LEDFORD, mailing add: Hanson-Van Winkle-Munning Company, 2920 Carroll Avenue, Chicago, Illinois (Electrodeposition)

FELIX B. LITTON, Foote Mineral Company, mailing add: 4017 Brunswick Avenue, Drexel Hill, Pennsylvania (Electrodeposition and Theoretical Electrochemistry)

JAMES J. MCINTYRE, E. I. du Pont de Nemours & Company, mailing add: Hillside Drive, Lewiston, New York (Industrial Electrolytic)

MATAM P. MURTI, mailing add: Department of Chemical Engineering, Case Institute of Technology, Cleveland 6, Ohio (Corrosion, Electrodeposition, Theoretical Electrochemistry, and Industrial Electrolytic)

S. C. OGBURN, JR., mailing add: Foote Mineral Company, 4041 Ridge Avenue, Philadelphia 29, Pennsylvania (Corrosion, Electrodeposition, and Electrothermics)

ALEXANDER R. ORBAN, mailing add: Niagara Alkali Company, P.O. Box 352, Niagara Falls, New York (Industrial Electrolytic)

CHARLES H. ORR, The Ohio State University, mailing add: 581 Eastmoor Blvd., Columbus 9, Ohio (Electrodeposition and Theoretical Electrochemistry)

LAUREL E. PUTMAN, Engineer Research & Development Laboratories, Ft. Belvoir, mailing add: P.O. Box 964, Alexandria, Virginia (Theoretical Electrochemistry)

WILLIAM D. ROBERTSON, mailing add: Institute for Study of Metals, 5641 Ellis Avenue, Chicago 37, Illinois (Corrosion and Theoretical Electrochemistry)

RICHARD S. ROBINSON, A. D. Little, Inc., mailing add: 515 Summer Street, Magnolia Station, Gloucester, Massachusetts (Industrial Electrolytic)

SAMUEL T. RUSSELL, mailing add: Blaw-Knox Company, 342 Madison Avenue, New York, New York (Theoretical Electrochemistry and Alkali and Chlorine)

FRANK SOLOMON, Yardeny Electric Company, mailing add: 555 W. 156 Street, New York 32, New York (Battery)

GUNNAR D. STENDAHL, American Smelting & Refining Company, mailing add: Box 382, Avenel, New Jersey (Theoretical Electrochemistry, Batteries, Corrosion, and Electrodeposition)

Employment Situations

Please address replies to box shown, c/o The Electrochemical Society, Inc., 235 W. 102nd St., New York 25, N. Y.

Positions Wanted

RECENT, PH.D. in Chemical Engineering, Johns Hopkins University, desires position specializing in research or development work. Two years' chemical engineering experience with Chemical Warfare Service prior to receiving doctorate degree. *Reply to Box 330.*

METALLURGIST, research and development experience in application of electrolytic leaching and furnace methods to production and refining of non-ferrous metals including copper, lead, zinc, tin, cadmium. College degree. *Reply to Box 331.*

POWDER METALLURGIST, production, development and research. Nine years' experience platinum and precious metal powder alloys. Fifteen years' production and quality control in tungsten and molybdenum refractory metal products. Graduate course in powder metallurgy. B.S. Sc. in chemical engineering, University of Toronto, 1923. *Reply to Box 332.*

Positions Available

METALLURGIST, for research on various phases of the electrolytic reduction of aluminum. Prefer advanced degree in physical chemistry or electrochemistry and/or five years' industrial experience. Location Washington. *Reply to Box A-211.*

ELECTROCHEMIST: A progressive organization requires either an electrochemist or a chemical engineer who has experience with graphite anodes in the caustic chlorine field. Must be capable of performing development and sales service. *Reply to Box A-212.*

ELECTROCHEMIST, B.S. or M.S., two years' industrial experience or more, age up to 30, for research and development work on storage batteries. Please submit résumé with salary desired. *Reply to Box A-213.*

ELECTROCHEMIST for research. Salary range is from $3,000 to $7,000 a year, depending upon qualifications. Location —Washington, D. C. *Reply to Box A-214.*

Recent Patents

Selected for electrochemists by Fred. W. Dodson, Chairman of the Patent Committee, from the Official Gazette.

March 1, 1949

Cary, H. H., and Baxter, W. P., 2,462,843, Glass Electrode.
Keller, F. R., 2,462,870, Electrodeposition of Copper.
Mandel, H. J., 2,462,880, Primary Cell of the Lead-Zinc Type.
Newman, M., 2,462,890, Electrostatic Precipitator System.
Sauerborn, E. P., 2,462,906, Manufacture of Metal Contact Rectifiers.
Skinker, M. F., 2,462,911, Rectifier.
Stateman, M. J., 2,462,917, Method of Manufacturing Rectifier Elements.
de Boer, F., 2,462,949, Method of Treating Selenium.
Hogaboom, G. B., Jr., and Hall, N. R., 2,462,968, Anode.
Ruben, S., 2,462,998, Primary Cell with Permanganate Depolarizer.
Kellogg, G. W., 2,463,039, Electroplating Copper Containing Coating.
Deibel, C. P., deceased, 2,463,089, Flat Dry Cell Battery Unit.
Lundbye, A. E., 2,463,190. Method of Producing Nickel Powder from Printing Press Plates and the Like.
Eduards, M. A., and Garr, D. E., 2,463,254, Electroplating Control System.
Ruben, S., 2,463,316, Alkaline Dry Cell with Permanganate Cathode.
Fink, C. G., and Chuk Ching Ma, 2,463,367, Method of Producing Tungsten.
Nachtman, J. S., 2,463,412, Electric Resistance Heat-Treating of Electroplated Coatings.
Williams, F. E., 2,463,449, Cadmium Pyrophosphate Phosphor.
Birdsall, C. G., 2,463,454, Dry Cell Battery.
Frasch, J., also known as Freud, H. M., 2,463,483, Protection of Metallic Objects by Galvanic Action.

March 8, 1949

Ruben, S., 2,463,565, Dry Primary Cell.
Lee, W. H., and Smith, E. D., 2,463,702, Battery Charger.
Nagle, P. I., 2,463,711, Electrolytic Method of Etching Metals with Stencils.
Veenemans, C. F., and Loosjes, R., 2,463,727, Process of Manufacturing Cathodes for Electric Discharge Tubes.
Albaugh, F. W., 2,463,733, Well Logging.
Dekker, A. J., 2,463,753, Process of Preparing Selenium for the Purpose of Increasing Its Conductivity.
Borden, P. A., 2,463,944, Constant Potential Source of the Thermocouple Type.
Upton, R. C., 2,464,008, Continuous Replenishment of Electrodes in Electric Salt Bath Structures.
Addink, N. W. H., Boucher, C. L., de Lange, C., and Kramer, J., 2,464,066, Method of Reducing the Leakage Current in Selenium Rectifiers.
Jacobson, M. G., 2,464,087, Method for Determining Oxygen in Gases.
Balke, C. W., 2,464,168, Electrolytic Iron for Powder Metallurgy Purposes.

March 15, 1949

Short, A. M., 2,464,267, Dehydrating Alumina in the Production of Aluminum.
Petersen, P. E., 2,464,714, Intermittent Discharge Induction Melting Furnace.
Reiff, O. M., and Moore, A. M., 2,464,769, Separating Alkyl Benzenes from Admixture with Paraffins and Naphthenes.

March 22, 1949

Buser, J. S., 2,464,846, Method of Testing Plating Solutions.

Pike, R. D., and Schoder, J., 2,464,889, Process for Making Electrolytic Iron.
Ball, C. J. P., and Jessup, A. C., 2,464,-918, Magnesium Base Alloys.
Copson, H. R., 2,464,922, Prevention of Pencilling Corrosion of Metallic Salt Bath Electrodes.
Van Nordstrand, R. D., 2,465,137, Electric Resistance Furnace.
Craig, P. H., 2,465,202, Hermetically-Sealed Storage Battery with Gas Recombining Means.
Hein, C. C., 2,465,228, Liquid Treatment of Contact Surfaces for Copper Oxide Rectifiers.
Considine, D. M., 2,465,322, Target Tube for Radiation Pyrometers.

March 29, 1949

Strickhouser, S. I., and Uhlig, E. C., 2,465,493, Embossed Battery Separator.
Gibson, T. M., 2,465,524, Liquid Immersed Rheostat.
Scavullo, A. C., 2,465,608, Method of Producing Copperplated Culinary Vessels.
Pessel, L., 2,465,747, Apparatus for Electroplating Metal.
van Geel, W. C., and van Amstel, J. J. A. P., 2,465,768, Blocking-Layer Cell.
van Meurs, H. A., 2,465,769, Discharge Device with Connector of Low Thermal and High Electrical Conductivity.
Wernlund, C. J., 2,465,773, Process of Producing a Catalytic Article.
Avery, H. S., 2,465,780, Heat-Resistant Alloys.

April 5, 1949

Gall, J. F., and Miller, H. C., 2,466,095, Electrochemical Process for Polishing Tantalum.
Vollrath, J. P., 2,466,137, Thermocouple Support.
Kretsch, H. W., and Miner, D. B., 2,466,-175, Thermocouple Sheath with Exposed Junction.
Brenner, B., 2,466,202, Compensating Lead for Thermocouples.
Ray, W. A., 2,466,274, Thermocouple for Fuel Burners.
Straumann, R., 2,466,285, Nickel-Iron Alloys Adapted for Springs in Thermocompensated Oscillating Systems.
Byrd, W., Jr., 2,466,371, Apparatus for Electrostatic Concentration and Separation.
Blair, C. M., Jr., and Gross, W. F., 2,466,-517, Processes for Preventing Corrosion and Corrosion Inhibitors.
Loveland, T. A., Jr., 2,466,660, Lea Plating Bath.

April 12, 1949

Brown, H., 2,466,677, Electrodeposition of Nickel from an Acid Bath.
Shawcross, O. L., 2,466,971, Method of Chemically Coating Aluminum.
Kurtz, J., 2,466,992, Tungsten Nickel Alloy of High Density.
Tama, M., 2,467,058, Manufacture of Zinc Aluminum Alloys.
Hillier, J., 2,467,225, Reducing Specimen Contamination in Electron Optical Instruments.

Cathodic Protection—A Symposium

The collected papers of the Joint Symposium held in Pittsburgh, December 1947 by NACE and The Electrochemical Society

203 pages—cloth bound—illustrated

Order from: National Association of Corrosion Engineers
905 Southern Standard Bldg., Houston, Texas

Price: $6.00 to members of ECS or NACE
8.00 to nonmembers

Feature Section

Chemistry and Art*

The very intimate relation between chemistry and art is seldom appreciated. The great masterpieces of the world, whether paintings or sculptures, would long ago have passed out of existence and been forgotten except for the sound chemical foundation to begin with, and the resistance to chemical reactions of the materials used by the artist in the creation of his work of art. Few artists are conversant with even the first principles of chemistry and physics, and even fewer chemists have interested themselves in the basic requirements of the artist. During recent years museums of art and private collectors have become fully appreciative of the important bearing of chemistry upon art, not only in the creation of the objects of art, but also in the proper preservation of these objects. Dr. Fink has confined himself largely to the metals, but has also done some very interesting experimentation with old marbles, paintings, porcelain and ceramic ware, ivories, lacquer work, etc. A noteworthy development is that all museum cases today at the Metropolitan Museum have a chemically controlled atmosphere. Not only is harmful dust kept from settling on the surface of valuable art pieces, but destructive acid constituents of the air are automatically neutralized and destroyed.

Restoration of Bronzes

Dr. Fink's work on the restoration of ancient bronzes is well known to all museums. In the past, badly encrusted metal objects were usually cleaned by relatively crude methods. Fink and Eldridge reversed the process of corrosion and restored the details. An important discovery was that all the detail of design of a bronze, when undergoing corrosion, passes out into the crust. It is evident, therefore, that the mechanical removal of the crust will naturally take with it the detail of design, the most valuable part of a work of art. The electrochemical restoration recovers the detail.

Ancient Processes

Among the discoveries of Dr. Fink's laboratory is that the Egyptians knew how to apply silver-white antimony plate on copper articles. Another noteworthy finding is the electro-osmotic method of cleaning porous Grecian vases without losing the pigment particles which have been lifted from their original foundation during the period of burial in the ground.

Comments from Field Museum

The Field Museum of Natural History of Chicago, commenting on the electrolytic restoration of bronzes, which method it has now been using for years, states: "The Fink electrochemical process for the restoration of ancient bronzes has been in regular use at the Field Museum for years. This process has proved to be safe, simple and easily applied. The remarkable results reported by the Metropolitan Museum have been duplicated in every respect in Field Museum Laboratories."

The process for the restoration of ancient bronzes is now used in all important museums throughout the world.

Detection of Frauds

Another interesting field is the application of chemical and physical methods in the detection of frauds in works of art or the attribution of such works. The presence or absence of mere traces of impurities will often decide the spurious character of a work of art even though such work of art may have been classed as genuine by art experts on the basis of stylistic grounds. With the aid of modern scientific tools such as the electrolytic cell, the ultra-violet lamp, the chemical microscope, and the x-ray tube, facts are revealed which have for generations remained hidden.

* Highlights of an address by Secretary Emeritus Colin G. Fink before the American Chemical Society, Minnesota Section, on Friday, May 13, 1949.

Technical Notes and Reviews

Titanium, a New Structural Metal*

Introduction.—Five years ago, to hazard a guess, none of you gentlemen had even seen titanium in massive form, much less to have considered it as a structural metal. Today, however, over seventy laboratories are actively engaged in evaluating its potentialities. . . . The Bureau of Mines is responsible for a great deal of the initial research which was done on titanium and deserves major credit for educating the public concerning its basic properties. . . . Titanium is one of the four most abundant structural metals in the earth's crust, being exceeded only by aluminum, iron, and magnesium. . . .

Production.—The principal ores of titanium are ilmenite, an oxide of titanium and iron, and rutile, which is practically pure titanium oxide. The former is by far the most abundant and most important. Domestic utilization of titanium products has grown so rapidly that ilmenite consumption has increased from 25,000 tons in 1930 to over 380,000 tons in 1945. It is estimated that domestic reserves of usable ore, based on present technology, total 17,478,000 tons of ilmenite and 814,000 tons of rutile. These reserves correspond to 5,500,000 tons of titanium metal, providing ample domestic deposits upon which to base an industry.

Reduction of the ores of titanium to ductile metal is not easily accomplished. The major difficulty is rapid absorption of oxygen and nitrogen at elevated temperatures, resulting in a hard, brittle metal of little structural value. Pure titanium can tolerate relatively large amounts of alloying elements such as iron and chromium while retaining some ductility, while small amounts of oxygen and nitrogen (1%) result in embrittlement. These elements harden titanium as much as carbon hardens steel. Two basic problems in producing ductile metal have been, therefore, atmospheric contamination and incomplete utilization of any oxides or nitrides used in the processing scheme.

Different methods of eliminating these difficulties have been developed. In the first, using the so-called iodide method, ductile titanium is deposited on heated filament. Crude, non-ductile metal, usually prepared by direct reduction of the oxide, is charged to a glass or metal vessel and the air evacuated. A small quantity of iodine is then added and the temperature raised; titanium iodide forms which diffuses to a central electrically heated wire and is decomposed into titanium metal and iodine; the iodine is then free to repeat the cycle. The final product is a rod of high purity ductile titanium. While this method produces the highest purity metal, it is expensive and, as yet, has not proven itself adaptable to large scale production. As you can see, it is essentially a purification process, as known today, requiring crude titanium as one of the raw materials.

The second method of preparing ductile titanium is based on the reduction of titanium tetrachloride with sodium, calcium, or magnesium. By performing this reaction in the absence of air at elevated temperatures it is possible to produce sponge metal such as that which is on the table beside me. Titanium which the Du Pont Company is producing by this method has the following approximate analysis:

Titanium	99.5%
Iron	0.25
Nitrogen	0.06
Magnesium	0.05
Carbon	0.03
Oxygen	?
Chlorine	Trace
Manganese	Trace
Sodium	Trace
Calcium	Trace

Properties.—Titanium metal has three important structural properties. First, it is relatively light in weight; second, it possesses good strength; and third, it exhibits high corrosion resistance. . . . In the field of elemental construction materials, titanium lies between the truly light metals such as aluminum (2.70) and magnesium (1.74) and the

* Excerpts from an address by Dr. E. A. Gee before the Niagara Falls Section meeting on April 13, 1949 (See Section News).

heavy metals such as iron, nickel (8.90), and copper (8.94).

In strength, titanium again finds itself midway between the light and heavy metals, but, in this case, the position is reversed and its strength is considerably greater than aluminum and magnesium alloys, but lower than high alloy steel. . . . An important consideration in the majority of applications of a metal is not ultimate strength or density but strength per unit weight, i.e., strength divided by density. . . . It is immediately apparent that, in this respect, titanium compares favorably with all of these common structural materials.

A significant item is the high tensile and yield strengths of annealed titanium in combination with relatively good elongation. Its tensile properties in the annealed condition are superior, in fact, to alloy steels. A second interesting characteristic is the marked increase in tensile properties with limited cold work. For example, 25 per cent cold work raises the tensile strength to 110,000 psi which is almost the maximum attainable with full hard metal. Hence, small amounts of cold work in mechanical forming would result in high strength. Unfortunately, this advantage is partially offset by the decrease in ductility as measured by the elongation.

. . . The resistance of titanium to nitric acid is similar to stainless steel and includes all concentrations and temperatures to the boiling point. Resistance to sulfuric acid is not particularly good; concentrations above 10 per cent at room temperature result in prohibitive rates of corrosion. At high temperature even lower concentrations cannot be tolerated. Hydrochloric acid concentrations below 5 per cent at room temperature are not excessively corrosive but, again, elevation of temperature markedly lowers the range of usefulness. The metal is resistant to all concentrations of phosphoric acid at room temperature and to boiling chromic acid. All concentrations of hydrofluoric acid rapidly react with titanium while it is reasonably resistant to aqua regia at room temperature.

Many people have mistakenly reached the conclusion that titanium is a suitable material of construction for high temperature service. Long term exposure to air at temperatures above 1300 F results in embrittlement due to the aforementioned oxide and nitride contamination. Titanium should not be considered for high temperature applications, as in addition to oxygen and nitrogen, the metal will react at elevated temperatures with water, hydrogen, carbon monoxide, and carbon dioxide.

For short time exposure, the picture is quite different, and titanium apparently possesses advantages over certain materials now utilized. Exposure of titanium, 302 stainless steel and 24 ST aluminum to an oxidizing flame for 30 minutes at 2200 F resulted in rapid burning of the aluminum alloy but did not effect the strength of either the steel or the titanium. As a light weight firewall in aircraft, an appreciable savings in weight might, therefore, be effected.

Fabrication.—Titanium can be easily forged in the temperature range 1800 to 1600 F. Ingots can be rolled without difficulty in the temperature range 1200 to 1400 F and annealing is accomplished by heating for one hour at 1300 F. Any resulting oxide film can be removed by conventional descaling practice such as sodium hydride treatment. The sample of strip which I have in my hand was prepared from Du Pont ingot metal.

Machinability can be compared directly to 18-8 stainless steel, the same tool angles, cutting speed and feeds are usually satisfactory.

Titanium can be readily spot welded, seam welded, and inert arc welded to itself although no data are yet available on joining to other metals.

The electrical resistance of titanium is relatively high. Titanium at 55 microohms per cm is markedly higher than the other common metal listed.

Conclusion.—To summarize briefly, we can say that titanium may some day fill the gap in structural materials between aluminum alloys and stainless steel so far as density and strength at intermediate temperatures is concerned. In addition, its strength weight ratio compares favorably with alloys of magnesium, aluminum, and the stainless steels. Wherever it is possible to substitute on a direct volume basis for steel, weight savings of 40 per cent results.

Its corrosion resistance to certain media is good and it should find application in the chemical industry. In sea water its resistance to attack is outstanding, comparing favorably with platinum and Hastalloy C.

Many potential uses will undoubtedly come to mind, and a few that we have considered follow:

1. Marine applications where corrosion resistance to sea water is a primary consideration.

2. Chemical equipment where resistance to a specific media such as wet chlorine or ferric chloride is required.
3. Structural applications where intermediate temperatures, (800 F) are involved such as in aircraft power plants.
4. Many other miscellaneous applications suggest themselves where a combination of light weight, corrosion resistance, high strength, and intermediate temperature properties are required.

Many of us feel that titanium stands in a position analogous to aluminum at the turn of the century. It is a new material, as yet relatively untested, which could greatly supplement our present structural pattern. Those of us who have had an opportunity to work with this metal have great confidence in its future and it does not seem optimistic to visualize titanium as a tonnage metal within the next ten years.

Report of the Chlor-Alkali Committee
For Three Year Period Ending 1948

*R. B. MacMullin**

The last report of this committee was presented by S. Cottrell for the year 1945. During the past few years there have been numerous published reviews of the chlorine-alkali situation. In the present report we will only highlight the significant developments.

The Changing Scene

The four arsenal plants of the Chemical Warfare Service were leased as follows: Huntsville, Alabama, to Solvay Process Company; Pine Bluff, Arkansas, to Diamond Alkali Company; Edgewood, Maryland, to Diamond Alkali Company; Denver, Colorado, to Colorado Fuel & Iron Company. The Denver plant was shut down toward the end of 1948, but all the other plants are operating at capacity, and Diamond has recently announced an increase in capacity of 30 per cent at Edgewood.

The five plants built by the Defense Plants Corporation have been disposed of by the War Assets Administration as follows: The chlorine facilities at the Basic Magnesium plant at Henderson, Nevada, have been leased to Stauffer Chemical Company. Of the original 225 tons chlorine capacity, approximately 150 tons are at present operable. A number of chlorine consuming industries have taken up quarters in other parts of the plant, and today a substantial part of this chlorine is being consumed locally. The magnesium plant at Lake Charles, Louisiana, has been dismantled and a major portion of the facilities sold to the Southern Alkali Corporation. These facilities include part of the power plant, rectifying stations, the cell rooms, and several other buildings, which have been converted into a 240 ton per day chlorine plant using Columbia type Hooker cells. The 125-ton chlorine plant at Velasco, Texas, has been purchased by the Dow Chemical Company, and a five-mile pipe line for chlorine connects the Velasco plant with the Freeport operations of that company. The 200-ton chlorine plant at Natrium, West Virginia, has been purchased by the Pittsburgh Plate Glass Company. The 25-ton chlorine plant at Memphis, Tennessee, has been purchased by the Heyden Chemical Company. The above plants are all on full scale operation.

The Diamond Alkali Corporation has built a new chlorine plant at Houston, Texas, having a capacity of 220 tons per day. The Pennsylvania Salt Manufacturing Company has completed a new 60-ton plant at Portland, Oregon. The Hooker Electrochemical Company increased their chlorine facilities at Tacoma, Washington, to 100 tons per day. Wyandotte Chemicals Corporation has built a new 100-ton mercury cell installation at Wyandotte, Michigan. The Solvay Process Company has enlarged their mercury cell chlorine plant. The Ecusta Paper Company has built a 6-ton chlorine plant of the Sorensen cell type at Pisgah Forest, North Carolina. The Frontier Chemical Company built a 10-ton plant at Seagraves, Texas, in 1947, and has recently announced a doubling of capacity. Monsanto Chemical Company has recently modernized

* R. B. MacMullin Associates, 8249 Troy Avenue, Niagara Falls, New York

and enlarged their chlorine plant at East St. Louis, Illinois, with an installation of 20,000 ampere Hooker cells.

The above additions bring the number of chlorine plants in the United States to 67 and represent 44 separate operating companies. Of these plants, four are smaller than 2-tons capacity, and six were not operating at the close of 1948. Combined productive capacity of these plants at the end of 1948 was approximately 5,500 tons per day.

In Canada, the Aluminum Company of Canada at Arvida, Quebec, has put into operation a 60-ton chlorine plant using Mathieson type mercury cells. The Dominion Alkali Company, Ltd., at Beauharnois, Quebec, has recently completed a 60-ton chlorine plant using Krebs type mercury cells. The Dow Chemical Company of Canada, Ltd., Sarnia, Ontario, has built a 50-ton chlorine plant of the mercury cell type, using a modified I. G. Farben cell. Above additions to the Canadian chemical industries bring the number of chlorine plants in that country to nine, with a total productive capacity of approximately 400 tons per day.

In addition to the aforementioned fait accompli, several other plans for new plants or modernization of old plants have been announced. The most interesting of these is the proposed sodium and chlorine plant of the Du Pont type, to be built by National Distillers Company as Ashtabula, Ohio.

The large increase in chlorine productive capacity that took place during the war years has already been noted in previous reports. The phenomenal postwar increase in productive capacity is worthy of comment. Production figures for chlorine and caustic soda for four years are given in Table I.

It is thus seen that present production for 1949 is at the rate of 1,854,000 tons per year, or more than 5,000 tons per day, which is an increase of 55 per cent over the 1945 production. Moreover, chlorine plants are running substantially at capacity, and in some cases over capacity. With so narrow a margin between actual production and productive capacity, the indications are that the chlorine market is still expanding, and that further increases in chlorine plant facilities may be expected. Of the total chlorine made, approximately 87 per cent is now produced concurrently with caustic soda, the balance concurrently with metallic sodium, caustic potash, soda ash, and sodium nitrate.

TABLE I. *Chlorine and caustic production*

Chlorine (tons)	1945	1946	1947	1948
Co-produced with electrolytic NaOH	1,000,000	1,000,000	1,240,000	1,410,000
Other	192,000	165,000	206,000	211,000
Total (exact)	1,192,081	1,165,126	1,446,865	1,621,031
December 1948 total				154,460
Annual rate, December 1948				1,853,638

Caustic soda	1945	1946	1947	1948
Electrolytic	1,129,312	1,129,956	1,386,995	1,587,831
Lime soda	734,993	742,932	747,267	769,707
Total	1,864,305	1,872,888	2,134,262	2,357,538
December 1948 electrolytic				154,923
Annual rate, December 1948, electrolytic				1,859,076

TABLE II. *Uses—1948*

Chlorine	Approx. %
Pulp bleaching	11
Disinfectants and sanitation	4
Textiles	3
Chlorinated Products	77
Miscellaneous uses	5
Total	100
Caustic	
Soap	4.4
Chemicals	22.7
Petroleum refining	7.3
Rayon and films	21.4
Lye and cleansers	5.6
Textiles	4.5
Rubber reclaiming	1.1
Vegetable oils	1.0
Pulp and paper	6.0
Exports	7.9
Miscellaneous	18.1
Total	100.0

Of the total caustic soda produced, 67½ per cent was accounted for by electrolytic process in 1948. The balance was produced by the lime soda process.

Lime soda caustic has shown only slight gains, whereas electrolytic caustic has shown a 55 per cent gain—the same as for chlorine. Some companies making both electrolytic and lime soda caustic report that the gain in electrolytic caustic has been offset by loss in lime soda production. Present indications are that, on the whole, lime soda caustic production will show a downward trend in the future as compared to an upward trend in electrolytic caustic.

The distribution and uses for chlorine and caustic soda as of 1948 are shown in Table II. More than 77 per cent of the chlorine production is used in chemical manufacture. Of this, more than 90 per cent can be accounted for in the manufacture of organic chemicals as pointed out by MacMullin.* The principal products involving the use of chlorine include mono- and dichlorobenzene, phenol, aniline, benzene hexachloride, chloracetic acid, tetraethyl lead, carbon tetrachloride, tri- and perchloro-ethylene, ethylene and propylene glycol, glycerine, nylon, vinyl and vinylidine chloride, detergents, and chlorinated paraffin. In addition to the above, the tonnage of bleached kraft pulp continues its upward trend, and, therefore, contributes to the increased demand for chlorine.

Technical Developments

Mercury cells

The postwar period reveals a new interest in mercury cells, partly because of the ability of this type of cell to make pure caustic soda in a range of 50 to 70 per cent NaOH without resorting to evaporation, and partly because of the possibility of making many compounds other than caustic soda concurrently with the chlorine. New developments in mercury cells include the following:

(a) *Krebs* type. Cells carrying 36,000 amperes or over are offered. These cells are unusually wide (about 4½ ft). To conserve floor space, the decomposing trough is placed underneath one edge of the electrolyzer. Mechanical sluicing takes the place of manual skimming of mercury. Continuous purification of the mercury is also featured.

(b) *Mathieson* type. This features a cell of unusually high current density (up to 3 amperes per sq in.). It also makes use of a tower decomposer of a submerged type. Large-sized anodes are individually adjustable. Minimum floor space requirements are claimed.

(c) *De Nora* type. These cells are now available through Monsanto Chemical Company. The electrolyzer is lined with a natural stone material completely resistant to corrosion and which is said to eliminate the danger of hydrogen evolution when the mercury flow is stopped. This cell features a 2-stage tower decomposer of the nonflooded type. The cells are laid back to back in pairs so as to conserve floor space.

(d) *I. G. Farben* type, horizontal cell. Both the 7 and 14 meter types are available. The rotating vertical cell is being further developed in Germany.

Diaphragm cells

(a) *Hooker Electrochemical Company* now points out that their type "S" cell can be operated at 10,000 amperes as economically as at 7500 amperes. They also offer a 20,000 ampere size cell which takes up only a little more floor space than the 10,000 ampere cell. This cell operates at a temperature of about 97 C.

(b) The latest *Diamond* cell has a capacity of 10,000 amperes, and is of a rectangular type with submerged diaphragm.

(c) *Billiter* cell. This cell has been greatly improved abroad and is now available in 12,000 ampere sizes. A new type of construction features rubber lined steel body and stainless steel diaphragm support. In some models anodes and cathodes are corrugated so as to minimize floor area.

Magnesium chlorine cells

The Hunt-MacMullin cell developed at the Consolidated Mining & Smelting Company of Canada was described in the pages of this JOURNAL in 1948.* It features the rapid circulation of electrolyte and automatic separation of molten metal from electrolyte. Anodes are vertical carbon plates. The cell has a high productive capacity per unit of floor space, and other interesting features.

Caustic soda purification

(a) Columbia Alkali Division of Pittsburgh Plate Glass Company has perfected the ammonia process for removal of salt and chlorate from diaphragm

* *Chem. Inds.*, April, 1948.

* Vol. 94, 151-160 (1948).

cell caustic. The entire production at Natrium is purified in this manner. The process is offered for license.

(b) Innes-Speiden Company obtains a high degree of purity in KOH by a unique crystallization process.

(c) In the manufacture of phenol by the hydrolysis of chlorobenzene with caustic soda, the presence of chlorate causes excessive corrosion in the reactor tubes. The Dow Chemical Company has developed a new process for removal of chlorate from diaphragm cell liquor.

Cathodic protection

Protection of nickel equipment for the high concentration of caustic soda by electrolytic means has proved successful and has gained favor.

Anhydrous caustic soda

The Dow Chemical Company has developed a successful high concentrator using Dowtherm as the heating medium. Nickel pickup in the caustic is said to be dependent upon the purity of the caustic used.

Chlorine compressors

Carbon ring reciprocating compressors which compress chlorine without lubrication are gaining favor. The successful use of this type of compressor is said to depend on the complete removal of entrained impurities in the chlorine gas.

Chlorine shipping

The 55-ton single unit tank car is gaining favor. By the end of 1948, there were 310 such cars in service. Liquid chlorine is now being shipped by barge on inland waterways. The larger-sized barge contains four tanks and has a total capacity of 600 tons of liquid chlorine.

Chlorine thermodynamics

The thermodynamic properties of chlorine, in tabular and graphic form, were recently published for the first time, by R. A. Hulme and A. B. Tillman of the Diamond Alkali Company. This is a welcome addition to the technical literature on chlorine.

Wet chlorine pumps

Ring seal compressors and vacuum pumps for handling wet chlorine were in extensive use in Germany and German operated plants. This type of compressor, which is made of stoneware, is now being offered by the General Ceramics Company, and is being tried out in several new chlorine installations.

Chlorine liquefaction

The Carrier system for condensing chlorine using Freon F-11 as a heat exchange medium is gaining favor. The Carrier system makes use of a 3-stage centrifugal compressor for the Freon. Although the first unit for chlorine was installed in 1941, by 1948 a total of 9 machines were in operation in four different plants with a total liquefying capacity of 640 tons.

Contact rectifier

The contact or mechanical rectifier, developed by Siemens-Schuckert and I.G. Farben in Germany during the war period, is now being manufactured in the United States in a greatly improved form by the I. T. E. Circuit Breaker Co. The first large-scale machines have recently been put into operation at the Buffalo Electrochemical Company and are said to be performing according to expectations. This development is considered particularly significant because it makes possible the efficient transformation of alternating to direct current in the low voltage range —that is from 400 volts down.

Mercury cells for kraft pulp

A particularly advantageous application of mercury cells has been pointed out by R. B. MacMullin. This consists of satisfying the requirement of cooking chemical make-up in the form of sodium sulfide and the requirements of bleaching chemicals in the form of caustic and chlorine, all of which can be made by the mercury cell process. In many kraft plants, a suitable balance can be obtained with interesting economic advantages. The process eliminates the use of salt cake.

Titanium metal

A new process for the manufacture of titanium metal has been developed by the U. S. Bureau of Mines, and is being piloted by the Du Pont Company. This consists in the production of titanium tetrachloride and magnesium metal. The chlorine and the magnesium required for this process are obtained, of course, from the electrolysis of magnesium chloride.

The UN Program for Better Living

The United Nations will swing into action this month on a subject less glamorous, but equally important compared with its other objectives concerning the world's welfare. Starting August 17, a series of conferences are being sponsored on conservation and utilization of resources. Scientists and technical experts from many countries will gather at Lake Success to exchange ideas on extending or more effectively using our present world supply of minerals, topsoil, forests, water, fuels, fish and wildlife. Suggested by President Truman and aimed at helping our neighbors across the oceans, the exchange of ideas will benefit us as well, for nowhere has there been more prodigal waste of our heritage than in this country.

Three weeks will be devoted to discussion of topics such as increase of mineral resources by discovery, conservation in mining and milling, conservation of metals by substitution of those more plentiful, techniques of oil and gas discovery, methods for increasing coal production, efficient utilization of fuel such as gasification of coal at the mines, appraisal of water resources, protection of forests and their administration, methods of soil conservation, and research in the conservation of marine resources. Electrochemistry properly enters the program through discussion of topics such as corrosion control, conservation of tin by continuous electrolytic tin plate, and utilization of low-grade ores by electrowinning. Occupying a full session of the Conference, there will be discussion in detail by representatives from France, England, The Netherlands, and the United States on the cost of corrosion, and methods available for corrosion control.

Corrosion is an electrochemical process by which metals revert to their ores or to other compounds. Often, a crumbling dust remains where useful metal structures stood before. The waste is not only of metals, but also of human effort entering the fabrication and manufacture of structures, equipment, and machinery. The cost of corrosion to this country alone is carefully estimated as more than $6,000,000,000 annually, including the cost of coatings and other protective measures. Thought to this problem reveals that a reasonable research and educational program, well organized and adequately supported, can within perhaps five years save approximately $1,000,000,000 of this amount each year. This can be accomplished by better coatings, more effective use of cathodic protection, increased use of corrosion inhibitors and corrosion-resistant alloys, and by other means. Large savings, for example, can be effected in reduced wear of automotive engines, which recent investigations show is caused not only by mechanical abrasion, but at least equally by corrosion of cylinders and piston rings. Inhibitors and corrosion-resistant metals, therefore, may save millions of dollars now lost wherever internal combustion engines are used. This is one of the items to be presented before the Conference.

In the civilized world in past years, the veto has been used indiscriminately against many conservation measures because the horizon of comprehension concerning factors entering the welfare of humanity was too restricted or hopelessly narrow. The true factors are now increasingly obvious, and it has become apparent to more than a minority group that waste must stop, and more intelligence must be applied to the utilization of our natural resources. Support of conservation benefits us all; effectively applied it improves our standard of living and replaces fear for the future with hope and renewed confidence.

Current Affairs

Chicago to Offer Well-Rounded Program

The plans for the 96th meeting of The Electrochemical Society in Chicago on October 12th, 13th, 14th, and 15th, 1949, are well advanced. The entire 19th floor as well as part of the 18th floor of the headquarters hotel, the La Salle, will be at the disposal of the Society at that time. The Chicago Section is looking forward to the convention in the expectation that a large number of the Society's members regard the October meeting as a "must" on their calendar of important events. In supplementing the excellent technical program of papers and plant trips, the local committee, headed by Chairman C. A. Hampel, is planning for entertainment that should provide both relaxation and enjoyment for all. It is even rumored by those on the "inside" that the once-famous "Section Q" will again be in action.

The La Salle Hotel is at Madison and La Salle Streets in the Chicago Loop. Advance registrations for rooms should be made direct to the hotel and reservation cards for that purpose will be mailed to the membership in ample time. Furthermore, those who plan to attend also will have the opportunity of registering for the convention in advance, a convenience that has been much appreciated in the past.

On Wednesday, October 12th, several committee meetings are to be held. Registration will start that evening. Technical sessions will begin on Thursday morning and will continue each morning and afternoon through Saturday, October 15th. These sessions will be in charge of the Corrosion, Electroorganic, and Electrodeposition Divisions, each of which is presenting a

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STATE AND MADISON STREETS—CHICAGO'S SHOPPING CENTER

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ART INSTITUTE ON MICHIGAN AVENUE

program of papers. Several round-table discussions also are planned. Plant trips are scheduled for both Thursday and Friday afternoons.

Electro-Organic Symposium

The Electro-Organic Division will present its largest program of papers at the Chicago symposium. Chairman Clyde A. Crowley expects that between 15 and 20 papers will be on the program which will extend over two days, tentatively scheduled for Thursday and Friday, October 14th and 15th. A round-table discussion is to follow the formal program of papers which is expected to attract an unprecedented attendance.

Analytical chemistry will vie with electro-organic synthesis at the symposium. Organic polarography has experienced tremendous advances within the last few years and this subject will be presented comprehensively by the various contributors to this important meeting.

The final session will be devoted to another of the ever-popular electro-organic round tables. Industrial electro-organic processes will be emphasized, though there also will be a discussion of the economic evaluation of electro-organic processes together with a consideration of technological matters. The final round-table program will appear in the September JOURNAL.

A tentative list of papers to be presented at the electro-organic sessions was published in the June issue of the JOURNAL, p. 122*C*. Additional papers not listed on the earlier program are:

"Studies on Alternating Current Electrolysis. I. Nature of Polarization Capitance and Polarization Resistance" by M. Shaw and R. E. Remick, Detroit, Michigan

"Studies on Alternating Current Electrolysis. II. Interpretation of Oscillograms" by J. Silverman and A. E. Remick, Detroit, Michigan

"Oxidation of Ethyl Alcohol at a Platinum Anode" by B. O. Heston and S. R. Faris, Norman, Oklahoma

"Formamide of Electrolyte Solvent" by M. Schwab, Athens, Greece

Electrodeposition Symposium

The interesting program of papers to be presented before the Electrodeposition Division is nearly complete. Chairman R. A. Schaefer of that division reports that at least 9 or 10 papers will be on the program which is scheduled for Saturday, October 15th. The Saturday session will make possible the attendance of many of the Chicago-area electroplaters interested in the program. Papers which have been accepted or are being processed by the Publication Committee range over a variety of subjects including deposition of metals on aluminum by immersion, formation of zinc ferrite in electrowinning, codeposition of chromium and molybdenum, high-efficiency anode for alkaline tin-plating, and electrodeposition of molybdenum.

At this writing, it seems probable that papers will also be presented on the theoretical aspects of fused salt cleaning, and x-ray method of determining coating thickness, chromium plating, and a second paper on the electrodeposition of aluminum.

A division luncheon in honor of a special guest is being planned in conjunction with the electrodeposition session. The luncheon program is not yet complete, but it is expected that it will include a progress report on the revised edition of "Modern Electroplating."

Among the committees that will meet at Chicago is B-8 of the American Society for Testing Materials. This is the committee on Electrodeposited Metallic Coatings which includes many members of the Electrodeposition Division. This committee and its many sub-committees, with an estimated total attendance of 50 of its 144 members, will hold numerous business meetings over a period of several days prior to the Electrodeposition Division session.

Corrosion Symposium

The Corrosion Division is holding its annual symposium at Chicago and, as usual, a program of interesting papers is in prospect. It has been the custom to hold the annual corrosion symposium at the spring meeting of The Electrochemical Society; however, because of the annual spring meeting of N.A.C.E., it now is being scheduled for the October meeting. Details of the Chicago symposium will appear in the September JOURNAL.

Battery Round Tables

In addition to its annual business meeting, the Battery Division is planning two informal round-table discussions, chosen to interest members working either with primary or secondary cells. Additional information about the meeting and discussions may be found on page 31C of this issue.

Plant Visit to Armour Research Foundation

Those attending the meeting will have the opportunity of not only hearing an excellent program of technical papers, but they will also have the opportunity of seeing in action one of the more recently established research institutions, the Armour Research Foundation of Illinois Institute of Technology. The Foundation, directed by Dr. Haldon A. Leedy, is cooperating with the Chicago Section to make the conducted tour of its facilities highly informative and instructive.

Armour Research Foundation, in affiliation with the Armour Institute of Technology, was created as a separate corporation in April, 1936, as a "not-for-profit organization to render a service of research, development, and experimental engineering to industry and government." It now preserves the name of the Institute when the latter was consolidated in 1941 with Lewis Institute, also located in Chicago, to become the Illinois Institute of Technology. The Foundation has grown from a staff of three scientists and an annual research volume of $40,000 to the second largest independent research organization in the United States with a staff of 640 and an annual volume of research exceeding $4,000,000. Over 2,200 sponsors have been served since its inception.

The work of the Foundation and the Institute is carried on largely in the physical facilities located at Technology Center, a 110-acre campus on the near south side of Chicago, where the buildings of the earlier Armour Institute were located. It is not far from the Loop in the region centering at 33rd and South State Streets. The Association of American Railroads is now constructing a research laboratory on this campus which is immediately adjacent to railroads and manufacturing plants which these institutions serve.

The Foundation maintains three divisions: Research, International, and Magnetic Recorder.

The work of the Research Division is carried on in six departments—applied mechanics, ceramics and minerals, chemistry and chemical engineering, electrical engineering, metals, and physics. More than 110 industrial organizations and 20 government agencies sponsored research programs at the Foundation last year.

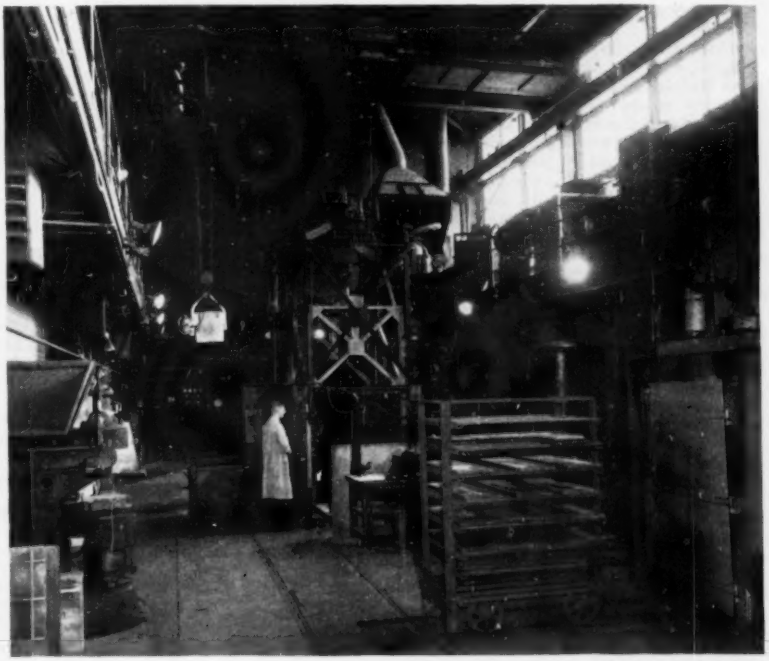
The International Division, which completed its first full year of operation in 1948, though it first pioneered in this field in Argentina in 1942, is believed to be the only organization of its kind in existence. Through it the Foundation serves the international field directly, the only institute rendering such service. It undertakes to provide for other countries the same impartial, non-profit, non-political industrial research available in the United States. The most

significant international work is being done in Argentine, Mexico, Haiti, and Puerto Rico. In 1945 the Foundation organized the Mexican-American Conference of Industrial Research, at which mutual problems of technological development were discussed. A new laboratory building was completed recently in Mexico City with fully-equipped laboratories, a 100-KVA electric power substation, an overhead crane, steam boiler, a variety of pilot plant equipment, technical library, and offices.

The important work of the Foundation in the field of magnetic recording is probably known to many of our members. It is one of the most valuable developments made by the Foundation. A radically improved form of magnetic recorder was introduced about ten years ago, and the resulting commercial product has made an industry. The Magnetic Recorder Division directs the research program, and provides a technical service to licensees, of which there are at present 44 domestic and 12 foreign concerns.

Services to Public

The Foundation also serves the public through its support of various activities, facilities, and services. Typical among these are its Ohmite Laboratory of Precision Electrical Measurements, Noise Survey of Chicago, several specialized laboratories, special industry conferences and symposia, precision mechanical measurements and national registry of rare chemicals (14,000 listed). It further serves the public by sponsoring research on the frontiers of science out of its general funds. During 1948 the Foundation sponsored 44 projects, most of which were of a fundamental nature.



Hedrick-Blessing Studio

INTERIOR OF METALS RESEARCH BUILDING WHICH IS LOCATED ON THE CAMPUS OF THE ILLINOIS INSTITUTE OF TECHNOLOGY. THIS INTERESTING LABORATORY IS BEING USED BY ARMOUR RESEARCH FOUNDATION FOR INDUSTRIAL RESEARCH

Furthermore, several conferences and symposia on technical subjects are sponsored each year.

In addition to the trip to Technology Center, trips to manufacturing plants are being planned. A selection is yet to be made from the list of several possible group plant visits.

Ladies' Program

The Ladies' Program, which is being planned by a committee under the chairmanship of Mrs. C. A. Hampel, is about completed. The events of the two days will be initiated on Thursday morning, October 13th, by a Milwaukee-style "Kaffee-Klatsch." This will permit those attending to meet their old friends, to make new friends, and to learn the details of the entertaining program in store for them. A well-balanced program has been planned which will appeal to a diversity of individual interests.

A special luncheon has been arranged for Thursday at Marshall Field's store, which, like the other big department stores, is just "around the corner" from the Hotel La Salle. Nothing is scheduled for the balance of the afternoon. This will permit the ladies to do what they please—satisfy the feminine yearning to shop—visit some of Chicago's public institutions such as the famous Art Institute which is only a step from Field's—or rest for the dinner and evening of entertainment in the Grand Ball Room.

On Friday morning, October 14th, the ladies' committee has a surprise in the form of an unusual sight-seeing trip. After completion of the trip, there will be a luncheon at one of Chicago's unique restaurants on the near north-side. From there the ladies will go by bus over the famed lake-shore drive to the internationally-known Oriental Institute located across the street from Rockefeller Chapel on the campus of the University of Chicago. Those visiting this fine museum will have the assistance of a competent guide. They will see the compact display unhurriedly in the allotted time and without being crowded. This museum houses many outstanding treasures of the ancient, near-eastern world. It was accumulated by the late Dr. James H. Breasted during his numerous archaeological expeditions. During the 30 years that it has been in existence the Institute has grown to become the world's largest center for study of the ancient oriental field.

La Salle Hotel

It's "handy" to stay at the La Salle . . . . On La Salle Street, the nerve center of the Midwest's financial activity, the La Salle Hotel is within walking distance of the wholesale, shopping, and theatrical centers. . . . Only three blocks east down Madison Street is the "World's Busiest Corner," State and Madison. . . . Two blocks north is "Chicago's Rialto," amusement and entertainment sector. . . . A few blocks west is the main terminal of the Chicago and Northwestern Railroad; and two blocks south of there is the Union Station serving the Pennsylvania, Chicago-Milwaukee-St. Paul and Pacific, the Burlington, the Alton. . . . Four blocks south is the La Salle Street Station, Chicago terminal for the New York Central, Big Four, Nickel Plate, and Rock Island. . . . and, at a short taxi jaunt are the three other railroad stations.

Mark Your Calendar Now
for the Chicago Meeting!
October 12, 13, 14, and 15, 1949

Battery Division to Sponsor Round Tables

The annual business meeting of the Battery Division will be held during the Fall Meeting of the Society in Chicago. At this time the election of officers and members-at-large of the Executive Committee will be held.

The Nominating Committee, consisting of O. W. Storey, Chairman, H. E. Haring and H. D. Wilson, have submitted the following nominations for the one-year term ending October 1950.

Chairman: C. C. Rose, Willard Storage Battery Company

Vice-Chairman: J. N. Mrgudich, Winchester Repeating Arms Company

Secretary-Treasurer: U. B. Thomas, Bell Telephone Laboratories

Members-at-Large: W. S. Loose, Dow Chemical Company, and S. Eidensohn, Navy Department, Bureau of Ships

Attention is called to the provision of the By-Laws that additional nominations may be made by any member of the Division, either in writing to the Secretary-Treasurer of the Division or from the floor at the Annual Meeting. Such additional nominations should be accompanied by an assurance of the nominee's willingness to serve if elected.

It is expected that there will also be discussion of changes of the By-Laws of the Division to provide for two-year terms for the officers. There will be reports on the Division's activities and discussion of future plans.

Plans are underway for two informal round-table discussions on battery problems to be held during the Chicago meeting. The subjects have been chosen to interest members working either with primary or secondary cells. The first will be concerned with the structures of the modifications of manganese dioxide, and the discussion will be handled by Dr. J. N. Mrgudich of the Winchester Repeating Arms Company, New Haven, Connecticut. There has been in the past some difference of opinion as to the interpretation and nomenclature of some of these structures and it is hoped that an informal discussion will lead to a definition of the areas of general agreement and form the basis for a program designed to settle the remaining differences.

The second discussion, to be conducted by Dr. Eugene Willihnganz of the National Battery Company, Depew, New York, will concern the low temperature characteristics of storage batteries, a subject of considerable importance in both military and civilian applications. Very considerable advances in performance have been achieved in recent years and it has seemed useful to review some of this work in an informal manner.

It is hoped that as many as possible of the Division's 166 members will be present and that the overseas members who may not be able to attend will make written contributions to the discussions.

U. B. Thomas
Secretary-Treasurer

Mining and Metallurgy Symposium and Lecture

The Second Sir Julius Wernher Memorial Lecture, and a Symposium on the Refining of Non-Ferrous Metals, arranged by The Institution of Mining and Metallurgy took place in London on July 6th, 7th, and 8th.

"The Effect of Impurities on the Properties of Metals" was the subject of the Memorial Lecture, given by Dr. C. H. Desch, F.R.S.

About 19 papers were prepared for the Symposium on Non-Ferrous Metals; eight sessions were held, two each morning and afternoon for two days. Preprints of the papers were available for those who wished to attend the meetings and the papers were not read, so that the whole time could be devoted to discussion. Admission to both events was free.

A few of the papers of special interest discussed were:

"The Refining of Gold and Silver" by A. E. Richards, Bullion Refineries, Johnson, Matthey & Co., Ltd.

"Refining of Aluminum" by John Waddington, British Aluminum Co., Ltd., Kinlochleven, Argyllshire.

"Cobalt Refining at Rainham Works of Murex, Limited" by P. S. Bryant, Rainham Works at Murex, Ltd.

"Tungsten—Its Preparation for Use in Electronics and Carbide Products" by T. F. Smeaton, The British Thomson-Houston Co., Ltd., Rugby.

"The Production of Ductile Zirconium" by G. L. Miller, Murex, Ltd., Rainham, Essex.

"The Electrolytic Copper Refinery of the Rhodesia Copper Refineries, Limited, at Nkana, Northern Rhodesia" by W. J. Friggens, Eric W. Page, and Thos. Milligan, Rhodesia Copper Refineries, Ltd.

Warner Named President-Elect of Carnegie Tech

Dr. J. C. Warner, Vice-President of the Society, was recently named President-Elect of Carnegie Institute of Technology, to succeed Dr. Robert E. Doherty, who will retire as Carnegie's President next year. James M. Bovard, Chairman of the Carnegie Board of Trustees, announced after a special Trustees Meeting on June 9th that Dr. Warner will fill a newly-created office of Vice-President until his inauguration after Dr. Doherty's retirement on July 1st, 1950.

At the Carnegie Board of Trustees meeting, Chairman Bovard explained that the search for a new president had been going on for more than a year. He revealed that a group of members of the Executive Committee of the Institute, a sub-body of the Trustees, had interviewed a number of candidates in the search for a man who had, in addition to other qualities:

1. "Scholarly background, preferably with experience in the educational field, and with the ability and integrity to give leadership to a distinguished faculty.

2. "Sympathy with the continuation of the development of the Carnegie Plan of professional education."

On the announcement of the President-Elect of the Institute, President Doherty made the following statement:

"Dr. J. C. Warner, whom the Board of Trustees announced this morning as my successor in the office of President of Carnegie Institute of Technology, is a man I have known and worked closely with for some thirteen years. Because of my intimate knowledge of his administrative ability stemming from his understanding of the institution and its purposes and from his integrity, forthrightness, and sound judgment, I congratulate Carnegie Institute of Technology on the prospect of his leadership in the years ahead."

Dr. Warner replied as follows: "I am honored and humbled by the confidence which the Trustees have placed in me and by the duties and opportunities that lie before me. With such strength as is in me and with the help of the faculty I will endeavor to prepare for and fulfill the duties of President.

"Under the able leadership of President Robert E. Doherty during the past 12 years, Carnegie has developed a distinctive program of professional education and has encouraged scholarly and artistic attainments of the highest order by steadily increasing the opportunities for research and other creative activities to members of the faculty and students.

"During this period, the Trustees, the administration, and the faculty have cooperated in studying all aspects of Carnegie's problems and plans for the future. As a consequence, sensible and effective policies have been agreed upon and adopted. Thus, in spite of the dislocations brought about by the war, Carnegie's course has been well charted and Carnegie's progress has been continuous. . . . . I am glad to say that I am in full sympathy with and eager to carry forward . . . C.I.T.'s fundamental educational program and its present policy of balance among fundamental research, graduate education, and undergraduate education. . . ."

Dr. Warner's election climaxes 23 years of outstanding service on the Carnegie faculty. He joined the faculty as an instructor in chemistry in 1926, moving from the academic ranks to become Professor of Chemistry and Head of the Chemistry Department in 1938. When Carnegie planned a marked expansion of its graduate program in 1945, Dr. Warner was appointed Dean of Graduate Studies in the College of Engineering and Science. Two years later, he assumed, in addition to his other titles, that of Assistant Director of the College of Engineering and Science.

As a Carnegie faculty member, Dr. Warner contributed to Dr. Doherty's program to develop the Carnegie Plan of professional education, which stands as one of the retiring President's major accomplishments.

Dr. Warner was away from the Carnegie campus for what turned out to be a two-year war leave from 1943 to 1945. During this time, he directed and coordinated research in the laboratories of the University of Chicago, University of California, Iowa State College, Massachusetts Institute of Technology, and at Los Alamos, New Mexico, in the highly confidential work on the purification of plutonium, a vital part of the development of the atomic bomb. He later participated in the operation of the Clinton Laboratories at Oak Ridge, Tennessee.

Currently one of three Directors-at-Large of the American Chemical Society, Dr. Warner is extremely active in professional and honor societies, and is a fellow of the New York Academy of Sciences, and a member of the American Institute of Mining and Metallurgical Engineers, Phi Beta Kappa, and Sigma Xi.

An active author as well as an educator, scientist, and administrator, Dr. Warner is co-author of two widely-used textbooks, "General Chemistry" and "Experimental General Chemistry," and a laboratory work-book, "General Chemistry Problems." He is also the editor and co-author of the fifth edition of "Leighou's Chemistry of Engineering Materials," and has written over 50 scientific and technical papers in the fields of physical chemistry and electrochemistry.

DR. J. C. WARNER, SOCIETY VICE-PRESIDENT, TO HEAD CARNEGIE TECH

Battery Research and Development Conference

The Signal Corps Engineering Laboratories, Fort Monmouth, New Jersey, announced at the Third Annual Battery Branch Research and Development Conference held on May 11th and 12th, 1949, at Red Bank, New Jersey, the development of a dry cell using magnesium rather than zinc as the anodic material.

New Magnesium Cell

The new magnesium cell has about twice the capacity of the conventional dry cell battery. Unlike other very high capacity batteries, magnesium dry cells can be manufactured using the same machinery as conventional dry cells. In addition, the fact that this battery uses magnesium, which is not a critical material, rather than zinc which is in fairly short supply, assures an adequate supply of dry cell batteries in the event of another national emergency. It is estimated by Dr. Roy Kirk of The Dow Chemical Company that the new battery, when in production, will cost approximately the same as conventional dry cells.

The Signal Corps Engineering Laboratories each year sponsor, under the direction of Mr. Grenville B. Ellis, Chief of the Battery Branch, the industry-wide conference at which this development was announced. Such conferences present Signal Corps progress in battery research and development to the battery and battery component industry. This conference is the most widely attended of any of the industry conferences on batteries. Over one hundred and eighty representatives of more than sixty manufacturers and Government agencies were present.

Magnesium Dioxide

At the morning session on May 11th, two papers on manganese dioxide were presented. Dr. G. H. Kissin of the Georgia School of Technology discussed the Georgia Tech electrolytic method for the production of battery grade manganese dioxide from low grade ores. Mr. Charles H. Clark of the Battery Branch, Signal Corps Engineering Laboratories, spoke on the Signal Corps manganese dioxide program. This program includes development of chemical, electron microscope, and x-ray diffraction methods for predicting the performance of manganese dioxide depolarizers in dry cell batteries.

Dry Batteries

Mr. F. S. Carpenter of Godfrey L. Cabot, Inc. reported on progress in the development of furnace blacks for use in dry batteries. The morning session was concluded with a presentation of the new standard line of military dry batteries. This standard line reduces the number of dry battery types required by the Armed Forces from over two hundred to thirty-one types.

Primary Batteries

The afternoon session on May 11th was devoted to presentation of the results of research on primary batteries. Dr. W. C. Vosburgh of Duke University spoke on advances in the knowledge of battery discharge mechanisms through polarization studies of anodic and cathodic materials at various temperatures. Dr. A. B. Garrett of Ohio State presented the results of fundamental investigation on electrolytes and electrochemical systems leading to information that can be used in the development of primary batteries which will operate at temperatures as low as −100 F. Mr. T. C. O'Nan of P. R. Mallory & Co., Inc., reported on work to improve the alkaline dry cell for low temperature operation. Dr. C. K. Morehouse spoke on progress in the development of non-reserve dry cells capable of operation at low temperatures. He reported that batteries capable of operation at −65 F have been constructed on an experimental scale, although performance is still below military requirements.

The afternoon session was concluded by Dr. A. Fischbach of the Battery Branch, Signal Corps Engineering Laboratories, who presented a paper on light-weight, small-size, special-purpose military batteries capable of very high discharge rates over a wide range of temperatures.

Secondary Batteries

The session on May 12th was devoted to presentation of the results of work on secondary batteries. Mr. H. Mandel of the Battery Branch opened the session with a paper summarizing investigations to improve the low temperature performance of storage batteries. He described in some detail the development, by the Delco Remy Division of General Motors,

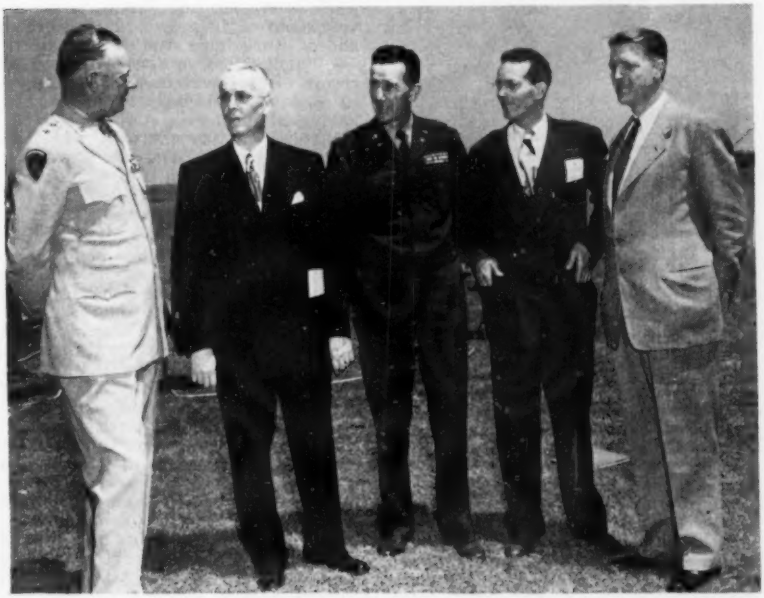
of an experimental lead-acid storage battery. This battery gave cranking discharge for two minutes at −65 F as well as improved performance at lower drains at sub-zero temperatures. Dr. L. L. Carrick of the University of Michigan presented his work on the development of a lead coated aluminum grid for lead-acid batteries. The purpose of this development is to produce lighter weight lead-acid batteries.

Mr. E. J. Ritchie of the Eagle-Picher Company discussed his investigations of the components of the lead-acid battery. The purpose of these studies is to correlate the crystal chemistry of lead compounds with the performance of batteries in which they are used. Dr. A. Fleischer of the Nickel-Cadmium Battery Corporation presented a paper on the results of development work on nickel-cadmium batteries with particular reference to the development of sintered plates.

Mr. Grenville B. Ellis closed the formal presentations at the Third Annual Conference with a review of the purpose and functions of the Battery Branch Research and Development Program and the benefits to the military and to the public resulting from such a program.

Social Program

In addition to the presentation of technical papers, there were several social events. These included a conference luncheon on May 11th, an informal cocktail party and dinner on the evening of May 11th, a conference luncheon on May 12th, and tours of the Signal Corps Engineering Laboratories. At the luncheon on May 12th, Major General F. Lanahan, Commanding General of Fort Monmouth pointed out the benefits to both commercial and government interests resulting from the cooperative spirit demonstrated at these battery conferences.



LT. GEN. F. LANAHAN, COMMANDING GENERAL, FORT MONMOUTH, NEW JERSEY DISCUSSING THE MILITARY BATTERY PICTURE WITH MR. L. WELLS, WILLARD STORAGE BATTERY CO., COL. P. NEAL, SIGNAL CORPS ENGINEERING LABS., MR. W. S. LOOSE, THE DOW CHEMICAL CO., AND MR. P. BUHRER, NATIONAL CARBON CO., INC., AT THE THIRD ANNUAL BATTERY BRANCH RESEARCH AND DEVELOPMENT CONFERENCE HELD IN RED BANK, NEW JERSEY, ON MAY 11th AND 12th, 1949.

Committee of Electrochemical Thermodynamics and Kinetics

A number of new methods of research in the fields of electrochemical thermodynamics and kinetics have been developed in recent years in several countries. A great many useful applications of these methods are possible, particularly in the field of corrosion.

At a meeting held at the University of Brussels, Belgium, on March 28th, 29th, and 30th, 1949, a number of electrochemists from several Western European countries created a new international organization designated as the Committee of Electrochemical Thermodynamics and Kinetics. The goal of the Committee is to facilitate and promote international collaboration in these fields. The members of the Committee will all be active research workers and will consent to orient some of their investigations in the directions which will be decided upon and occasionally revised at the meetings of the Committee. In each country where collaboration is secured, there will be a delegate in charge of coordination of the various activities within the program of the Committee.

PIERRE VAN RYSSELBERGHE

The officers of the Committee are at present: Pierre Van Rysselberghe, University of Oregon, President; M. Pourbaix, University of Brussels, Secretary. Delegates have been selected as follows: A. Juliard, Brussels, for Belgium; J. Heyrovsky, Prague, for Czechoslovakia; G. Charlot, Paris, for France; T. P. Hoar, Cambridge, for Great Britain; R. Piontelli, Milan, for Italy; W. G. Burgers, Delft, for The Netherlands; and E. Wyler, Bern, for Switzerland.

It was agreed at the meeting held in Brussels that the program of work would be the following:

1. Preparation of an "Atlas of Electrochemical Equilibria" which will be an extension of the fundamental work of M. Pourbaix on the potential-pH diagrams of iron, copper, chromium, etc., to all elements for which the necessary data are available. This atlas is being prepared at the present time by M. Pourbaix, P. Delahay, and P. Van Rysselberghe.

2. Systematic determination of polarization curves for electrochemical reactions. This vast program would consist of the extension of the fundamental work of Wagner and Traud, of the development of the polarographic method, and of overvoltage studies, etc.

3. Applications of the two foregoing groups of studies to corrosion, catalysis in solutions, electrolytic phenomena, analytical chemistry, etc.

Inquiries may be addressed to P. Van Rysselberghe, Department of Chemistry, University of Oregon, Eugene, Oregon.

Conductive Plastics

An interesting new class of materials called Markites has been invented and developed by Dr. Myron Coler, professor at New York University and representative of the Markite Company, New York, working with the Naval Ordnance Laboratory, Silver Spring, Maryland. The outstanding characteristic of these materials is that they have substantial and predeterminable electrical conductivities and, at the same time, possess the general mechanical and fabrication properties of ordinary plastics. Thermosetting, thermoplastic, and elastomeric variants have been produced. In addition, data have been obtained showing the effect on resistivity of changes in major variables such as frequency, current density, temperature, and continuous loading.

The materials are not being proposed as replacements for ordinary conductors, but rather as supplementary materials which will permit electrical engineers

to make some existing products more conveniently and efficiently, and to consider the design of others which may not have been considered feasible in the past. Although economically it would not be worthwhile to attempt to replace such items as ordinary wire lamp cords and fixtures with these conductive plastics, it would be practical to investigate the use of these materials for applications which require conductors that can be as readily and rapidly fabricated as ordinary insulator plastics and which possess comparable mechanical properties.

Markites are also proving of promise in connection with a number of applications which require unusual intermediate conductivity values, low density, solderability, special chemical resistance, ability to take a direct electroplate, and ability to form integral bonds with certain ordinary insulator plastics which will be leak-proof under the lowest and highest service temperature and conditions. The molding of three dimensional circuits is another interesting possibility. Examples of more specific applications of interest include: low ohmic resistors for the higher frequency ranges, nonlinear variable potentiometers, radar waveguide auxiliaries, attenuators, electroformed parts, shielding devices, hydrodynamic analogue models, heater elements, electrodes, and dissipators of static electricity.

The conductive plastic materials which have been the subject of this investigation include a number of distinctly different types. It is not to be inferred that any one grade or type of Markite can serve all purposes efficiently or that every conceivable specification requiring arbitrary combinations of electrical and other properties can be met. However, the latitude for ingenious and practical tailoring is so great that there is a fair chance of satisfying almost any reasonable specifications.

Questionnaire for File of Engineering Personnel

To provide source material for a who's who in engineering research, development, and other scientific operations for use by the National Military Establishment, the Engineers Joint Council, acting through the American Society of Mechanical Engineers, is co-operating with the Office of Naval Research in the creation of a source file of 100,000 key engineers in all branches of American engineering.

The source file of key engineering personnel thus obtained will provide a valuable tool for solving a variety of technical personnel problems, and will be available to private industrial, educational, and professional-society planning groups.

A four-page questionnaire will be mailed soon to 100,000 engineers holding the grade of member or higher in 18 national professional engineering societies, including The Electrochemical Society. The Engineers Joint Council points out that this will not be just another questionnaire, but one sent to engineers from the upper echelon of the profession. As it will provide the key to opportunity in professional and patriotic service, engineers selected to receive the questionnaire are urged to give it serious attention and to answer all questions fully.

Cathodic Protection—A Symposium

The collected papers of the Joint Symposium held in Pittsburgh, December 1947 by NACE and The Electrochemical Society

203 pages—cloth bound—illustrated

Order from: National Association of Corrosion Engineers
905 Southern Standard Bldg., Houston, Texas

Price: $6.00 to members of ECS or NACE
8.00 to nonmembers

An Open Letter to Members from the Secretary

At the meeting of the Executive Committee held in the Society offices on June 3, 1949, a complete change in method of handling discussion of technical papers at the semi-annual meetings was authorized.

The older members will recall in past years that the Society always had the oral discussion taken down by a stenotypist. Several years ago, this practice was discontinued since such service was exceedingly costly and, due to inflation conditions, the costs were mounting even higher. A wire recorder was used to pick up the oral discussion the last two years. This system undoubtedly could have been made to work if those people discussing papers had cooperated. However, in the heat of an argument, the microphone was disregarded with the result that transcription was a very difficult process. Coupled with this fact was our experience at the New York Meeting, at which time a wire broke, losing one entire reel of recorded discussion, and with the Philadelphia Meeting, where many of the discussions were completely unintelligible due to mechanical troubles with the wire recorder. Also, it should be pointed out that the process of obtaining a typewritten copy from the wire recorder again involved the services of a stenotypist since the average secretary could not transcribe from the wire recorder. This necessitated an exceedingly heavy financial burden on the Society. The Executive Committee, therefore, ruled that in the future the membership should be fully informed that no attempt will be made to take down verbatim oral discussion. However, this in no way should affect our present discussions. As a matter of fact, it may well improve the discussions, since those people who do not feel free to talk for publication may well be willing to express an opinion when they know it will not appear later in print.

All members desiring to discuss papers in writing are certainly welcome to do so, and will, in the future, be provided with paper on which they may write their comments, to be delivered to the Secretary-Treasurer of the Division before the end of the session. This discussion will then be referred to the author for answer and will be included in the TRANSACTIONS.

In keeping with this decision, the Managing Editor is now in the process of corresponding with all discussors of Philadelphia papers inviting them to submit their questions in writing. This decision will save the Society several hundred dollars a year, and it is felt that no pertinent scientific information will be excluded from our TRANSACTIONS by this procedure.

HENRY B. LINFORD
Secretary

Summer Meeting of AIEE

The A.I.E.E. Summer General Meeting for 1949, which was held in Swampscott, Massachusetts, June 20th to 24th, provided a technical program of broad interest, opportunity for a variety of inspection trips, sports events, and social recreation. Swampscott is ideally located on Boston's north shore.

Inspection trips included the Boston Naval Shipyard, M.I.T. and Harvard, WBZ Television, Lynn Telephone Exchange, The Mystic Station Boston Edison Company, and the General Electric Company.

The technical sessions began Monday, June 20th, and ran through Friday, June 24th.

On Thursday, morning and afternoon sessions, the "Symposium on Electrical Properties of Semiconductors and the Transitor" included papers of particular interest to electrochemists. They were grouped under the following heads: Nature of the Conductivity in Semiconductors, particularly Silicon and Germanium; Photo Effects in Semiconductors; Transformers; Semiconductor Rectifiers; The Transitor; Land Transportation and Lighting.

Papers included in the "Infrared Radiation" program, held Friday morning, were: "The Basic Optics of Infrared Radiation" by R. C. Lord, M. I. T. Spectroscopy Laboratory; "Radiation Detectors Applicable to Infrared Investigations" by A. R. Dennett, Epply Laboratories; "A New Thermionic Detector for Infrared Radiation" by E. D. Wilson, Westinghouse Electric Corporation; "New Military Needs in the Infrared" by C. S. Woodside, Navy Bureau of Ships; and "Industrial Application of Infrared Spectroscopy" by Van Zandt Williams, Perkin-Elmer Corporation.

Among the "Storage Batteries" papers (Friday A.M.) was "Prolonging Battery Life" by Dr. Eugene Willihnganz, Gould Storage Battery Company, a member of our Society.

From the Publishers

ELECTRONIC INSTRUMENTS edited by Ivan A. Greenwood, Jr., J. Vance Holdam, Jr., and Duncan Macrae, Jr. Published by McGraw-Hill Book Co., Inc., New York, 1948. 721 pages, $9.00.

This book is Volume 21 of the Massachusetts Institute of Technology's radiation series. It is arranged in five parts so that specific information on any one of the electronic instruments covered can be found quickly. Part I gives examples and uses, and describes the step-by-step methods used in the design of electronic computers. It lists 17 important types of representation, explains six arithmetic operations, etc. Each section is complete in itself, and the volume gives the complete data and details, the theory and application of electronic instruments.

INDUSTRIAL RHEOLOGY AND RHEOLOGICAL STRUCTURES by Henry Green. Published by John Wiley & Sons, Inc., New York, 1949. 311 pages, $5.50.

This manual and scientific working guide represents the first unique correlation of rheological and structural microscopic investigation. Rheology, the science of measuring the velocity of flow of fluids, is dealt with in a sound and concise manner. It is of especial value in dealing with such articles as printing inks, paints, oils, biologicals, and plastics. Particularly helpful are the many illustrations which supplement the text.

HANDBOOK OF INDUSTRIAL ELECTRONIC CIRCUITS by John Markus and Vin Zeluff. Published by McGraw-Hill Book Co., Inc., New York, 1948. 272 pages, $6.50.

A ready source of information about the circuits for any industrial application, this book gives complete information on all types—from counting to welding control, both simple and advanced. With each circuit there is a clearly drawn diagram and a comprehensive discussion of performance characteristics, practical applications, etc. Cross-reference indexed.

TREATISE ON POWDER METALLURGY by Claus G. Goetzel. Published by Interscience Publishers, Inc., New York, 1949. Vol. 1, 806 pages, $15.00.

This work will appear in three volumes, the first of which is now available. Volume I treats on the technology of metal powders and their products. It is a multi-purpose book for all branches of the metal industries designed for use by the expert or novice. Included are Terminology, Methods of Powder Production, Characteristics, Methods of Testing, Behavior, Molding, Compression, Sintering, and other data in the technology and application of metal powders.

Recent Publications of National Bureau of Standards

Copies of the following publications of the National Bureau of Standards may be obtained at listed prices from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Effect of Boron on the Hardenability of High-Purity Alloys and Commercial Steels, 30 pp., 15 cents (RP1938).

A study of the action of boron in relation to the hardenability of high-purity alloys varying in carbon content. The effectiveness of boron in these cases is believed to be due to its action in retarding the rate of nucleation of ferrite and carbide while in solid solution in austenite.

Calculation of Stress in Electrodeposits from the Curvature of a Plated Strip, Abner Brenner and Seymour Senderoff, 19 pp., 15 cents (RP1954).

This paper contains a derivation of formulas for the calculation of stress in electrodeposits from the curvature developed in a plated strip. All the formulas are derived from the fundamentals of the theory of elasticity, and the relationships among the various formulas are shown.

Section News

Chicago Section

The annual election of officers for the Chicago Section took place on May 13th at the Chicago Engineers' Club. Those elected to office and installed as of June 1st were:

Chairman: Clifford A. Hampel, Armour Research Foundation

Vice-Chairman: Paul W. Leppla, Great Lakes Carbon Company

Treasurer: Simon P. Gary, Jr., Scientific Control Laboratories

Secretary: H. D. Douglas, Jr., Graham, Crowley & Associates

A thorough exposition of "Electrochemistry in the Graphic Arts," presented by Dr. Marvin C. Rogers, Director of Research for R. R. Donnelly & Sons Company, concluded the 1948–49 program.

Dr. Rogers developed his talk as one who is trying to fathom the printing field with scientific principles. The evolution of modern commercial printing, he said, came through the efforts of ingenious craftsmen. As a result, the art can only be learned by the uninitiated through contact with printers. After a brief review of the history of printing, Dr. Rogers discussed at length the modern methods of letterpress, offset, and gravure printing. The problems, particularly those close to the electrochemical field, led to a free interchange of opinions and information during the discussion period which followed.

The wide appreciation and eager interest of the audience attested to the careful preparation of the subject, a complete and pertinent set of slides with sample illustrations, and the speaker's excellent delivery.

In addition to the above, Mr. Oliver W. Storey read a report by Dr. Sherlock Swann, Jr., and himself, delegates to the Local Section session at the National Convention.

H. D. Douglas, Jr., *Secretary-Treasurer*

Personals

Lincoln T. Work has become associated with the Powdered Material Research Laboratories, 11 Windsor Street, Cambridge, Massachusetts. Previously, Dr. Work had been Director of Research and Development at Metal & Thermit Corporation, New York City, for many years.

William J. Harshaw, President of the Harshaw Chemical Company, Cleveland, Ohio was awarded the honorary degree of Doctor of Science by Western Reserve University on June 15th. The award was in recognition of Mr. Harshaw's scientific discoveries in the fields of ceramics and electroplating.

James Martin Lohr, Manager of the Research Laboratories, Driver-Harris Company, Harrison, New Jersey, with whom he has been associated for many years, retired from that company on July 1st. Mr. Lohr has been a member of The Electrochemical Society since 1913.

Ralph A. Troupe has joined the Department of Chemical Engineering, Speed Scientific School, University of Louisville, Louisville, Kentucky.

Kissin and Bauer Form New Consulting Firm

Dr. G. H. Kissin has resigned his position as Research Associate Professor of Chemical Engineering at Georgia Institute of Technology and has moved to Berkeley, California, to form a consulting partnership with Dr. Norman Bauer, who was formerly with California Research Corporation. The firm, to be known as Physical Science Associates, will specialize in electrochemical and metallurgical problems as well as isotope analysis and other applications of mass spectroscopy.

Dr. H. M. Goodwin

Dr. Harry Manley Goodwin, former professor of physics and electrochemistry at Massachusetts Institute of Technology, and a charter member of The Electrochemical Society, died on June 26th, in his eightieth year.

Dr. Goodwin's association with M. I. T. covered half a century, climaxing his record as founder at Technology of the first course in electrochemical engineering ever given in this country. His own education was received at the Institute, followed by courses at Harvard, and the Universities of Leipzig and Berlin.

Returning to the Institute in charge of instruction in general physics, Dr. Goodwin inaugurated courses in chemical physics and electrochemistry, followed by a four-year course leading to the B.S. degree in electrochemistry, the first of its kind in America.

Dr. Goodwin had long been active in the development of the Institute's graduate courses and retired in June, 1940, with the rank of Honorary Dean of the Graduate School.

New Members

At the meeting of the Executive Committee held on June 3, 1949 at the office of The Electrochemical Society, Inc., 235 West 102nd Street, New York City, the following were elected to membership:

ALFRED D. GATE, Vanadium Corporation of America, mailing add: 729 Main St., Niagara Falls, New York (Electrothermic)

LORETTA H. KARCHNER, mailing add: Lamp Development Lab., Lamp Department of General Electric Company, Nela Park, Cleveland 12, Ohio (Electronics)

BACON, KE. Graduate student at Wayne University, mailing add: 5050 Cass Ave., Detroit 1, Michigan (Electrodeposition, Theoretical Electrochemistry, and Industrial Electrolytic)

HOWARD C. PARKMAN, Vanadium Corporation of America, mailing add: 4026 Bell St., Niagara Falls, New York (Electrodeposition and Electrothermic)

JACQUES PIGUET, Leclanche S. A., mailing add: Rue de la Plaine 14, Yverdon, Switzerland (Theoretical Electrochemistry, Batteries, Electronics, and Dielectrics)

FREDERICK J. RUTLAND, Norton Company, mailing add: P. O. Box 16, Chippawa, Ont., Canada (Electrothermic)

DONALD F. TAYLOR, mailing add: Fansteel Metallurgical Corporation, North Chicago, Illinois (Corrosion, Electrodeposition, and Industrial Electrolytic)

JAMIL P. THABIT, Graduate student at the University of Michigan, mailing add: 2021 Pontiac Trail, Ann Arbor, Michigan (Theoretical Electrochemistry, Alkali and Chlorine, and Electrodeposition)

CLARENCE A. WELTMAN, Alox Corporation, mailing add: 8572 Krull Parkway, Niagara Falls, New York (Corrosion)

Reinstatement

HENRY S. MYERS, City College, mailing add: 2226 Schenectady Avenue, Brooklyn 34, New York (Theoretical Electrochemistry, Batteries, and Electrodeposition)

JOSIAH WORK, mailing add: 1109 So. Bronson Avenue, Los Angeles 6, California (Corrosion and Electrothermic)

Employment Situations

Please address replies to box shown, c/o The Electrochemical Society, Inc., 235 W. 102nd St., New York 25, N. Y.

Positions Available

ELECTROCHEMIST: A progressive organization requires either an electrochemist or a chemical engineer who has experience with graphite anodes in the caustic chlorine field. Must be capable of performing development and sales service. *Reply to Box A-212.*

ELECTROCHEMIST, B.S. or M.S., two years' industrial experience or more, age up to 30, for research and development work on storage batteries. Please submit résumé with salary desired. *Reply to Box A-213.*

ELECTROCHEMIST for research. Salary range is from $3,000 to $7,000 a year, depending upon qualifications. Location—Washington, D. C. *Reply to Box A-214.*

Positions Wanted

METALLURGIST, research and development experience in application of electrolytic leaching and furnace methods to production and refining of nonferrous metals including copper, lead, zinc, tin, cadmium. College degree. *Reply to Box 331.*

POWDER METALLURGIST, production, development, and research. Nine years' experience, platinum and precious metal powder alloys. Fifteen years' production and quality control in tungsten and molybdenum refractory metal products. Graduate course in powder metallurgy. B.S. in chemical engineering. University of Toronto, 1923. *Reply to Box 332.*

Recent Patents

Selected for electrochemists by Fred W. Dodson, Chairman of the Patent Committee, from the Official Gazette.

April 19, 1949

Brown, H., 2,467,580, Electrodeposition of Nickel.

Kurtz, J., and Williams, H. G., 2,467,675, Alloy of High Density.

Noel, E. B., 2,467,687, High-Pressure Discharge Lamp.

Overbeek, J. T. G., 2,467,689, Lanthanum Silicate Phosphor.

Ripich, J. J., 2,467,701, Heat-Resistant Low Alloy Steels.

(*Continued on page 44C*)

Technical Notes and Reviews

The Enigma of Multiple Band Emission*

Gorton R. Fonda

Resolution of Multiple Bands by Change in Temperature

A change in the temperature of a phosphor leads, in many cases, to a change in the spectral location of its emission band. Before concluding that this denotes the shift of a single, unique emission band, it seems well to consider if the emission process may not involve a doublet band whose two peaks are so close together that the emission would appear to be that of a single band. The effect of temperature might then be to alter the relative intensities of these two constituent bands and, therefore, to simulate the shift of a single band.

Justification for such a view has been furnished by temperature measurements on phosphors which exhibit pronounced double band emission in the presence of a single activator. Several such phosphors have been described (1). It has been the contention of Butler (2) and of Nagy (3) that their emission can even be resolved into further subsidiary bands. There may not yet be general agreement on this point, but there is no doubt about the existence of the two main bands. A peculiar feature is that their relative intensity depends upon the activator concentration. At sufficiently high concentration, the longer wavelength band is the only one observed. As the concentration is lowered, the shorter wavelength band appears and increases in intensity. Simultaneously, the longer waveband decreases in intensity and is ultimately suppressed.

The significance of this to the present discussion is emphasized by the observation that the relative intensity of these two bands depends not only on the concentration of the activator but also upon the temperature at which the observations are made. An increase in temperature has the same effect as a reduction in activator concentration—namely, to reduce the intensity of the long wavelength band and to accentuate that of the short waveband. When either step is carried far enough, the long waveband is completely suppressed and the short wave becomes predominant.

These changes are well illustrated by the behavior of two typical phosphors in which the evidence for a double band emission is particularly clear, calcium silicate and zinc beryllium silicate, both activated with manganese. In measurements on the calcium silicate at 25 C, a red band at 6200 Å predominates under activation by 4 per cent manganese. A reduction in the concentration of the manganese lowers the intensity of this band and develops a shorter waveband at 5600 Å. When the manganese is reduced to 0.15 per cent, the 5600 Å band has become predominant. An increase in temperature leads to the same accentuation and eventual isolation of the short waveband, at 5600 Å, whether the concentration of the manganese is moderate or high (4).

Similarly with zinc beryllium silicate, decrease in concentration of manganese depresses the red band and intensifies the green. Increase in temperature serves also to depress the red band preferentially and eventually to isolate the green (5).

It is important to observe that the peak location of the short waveband, as isolated by increase in temperature, is identical or at least very close to its location at 25 C when isolated by reduction in manganese concentration. This observation is significant. It demonstrates that a change in temperature does not alter the position of the bands, but only their relative intensity.

Resolution of "Single" Emission Bands

A peculiar case of the same phenomenon is illustrated by the zinc silicate phosphor, activated with manganese. For practical purposes, this phosphor is regarded as having a single band emission lying in the green at 5250 Å. Actually the phosphor exhibits a double band

* Introductory address delivered May 5, 1949, before the Symposium on Luminescence held at the Philadelphia Meeting of the Society. The author is connected with the Research Laboratory of the General Electric Company, in Schenectady, New York.

emission. As pointed out by Kroeger (6), a red band appears with high manganese concentration in measurements at liquid air temperature. It has now been found that an increase in temperature of a phosphor containing a normal amount of manganese, lying in the range of 0.1–1.0 per cent, serves, it is true, to widen the width of the green band but fails to alter its spectral location, which remains fixed at 5250 Å. Inasmuch as the green band is to be regarded as the shorter waveband of a doublet, its independence of temperature is in accord with the observation on other phosphors in denoting that the spectral location of a constituent band of a doublet is not altered by change in temperature.

The importance of the observations on zinc silicate is emphasized by contrast with the behavior of those phosphors whose emission has been regarded as possessing a single emission band only. Well-known members of this group are the tungstates, cadmium silicate, cadmium borate, and zinc fluoride. In all cases their emission band has been found to be shifted to shorter wavelengths by an increase in temperature.

This temperature dependence makes one suspect that the emission of a reputed single band phosphor may actually comprise two bands, so close together that, at any one temperature, they merge into what appears to be a single band. The shift to shorter wavelength produced by an increase in temperature would then be nothing but a type of resolution in which the longer of the two bands is depressed in favor of the shorter.

Such phosphors evidently warrant further scrutiny. Careful tests seem to be in order, with the aim of finding if a change in activator concentration does, in fact, lead to the isolation of two constituent bands. If it develops that the number of phosphors exhibiting double band emission is larger than had been thought, some difficulty may be experienced in explaining the effect. A satisfactory theory could no longer be specific to a single phosphor but would have to be in broad terms to explain why the two factors, activator concentration and temperature, should produce the same alteration in relative intensity of the doublet bands.

Retention of Multiple Bands During Phosphorescence

Some recent experiments on phosphorescence present a further difficulty to be met in the development of a satisfactory theory. When a phosphor contains a single activator, it now appears that its initial exponential decay is always homogeneous. If the emission is confined to a single band, one would, of course, expect the decay to be homogeneous. When, however, the activator gives rise to two emission bands, it has been concluded, on reasonable grounds, that two independent centers are involved, each with an emission process of its own and each associated with a specific condition of the activator (7). If this were so, however, the phosphorescence decay should be of a duplex nature such as exists when two activators are present. An illustration of this situation is furnished by measurements on calcium halophosphate, activated with antimony and manganese, whose luminescence changes in color during the decay, due to the more rapid decay of the emission band in the blue, activated by antimony (8).

No such effect has been observed in the decay of the double band emission from zinc beryllium silicate, activated with manganese alone. Its two emission bands are well separated from one another, lying in the green and red. Its decay curve, however, shows but a single exponential rate, with no evidence that it is a composite of two different decay processes, each at a necessarily somewhat different rate. In agreement with this, the phosphorescence spectrum is identical with the fluorescence spectrum (8). If this proves to be true for all cases of double band emission, it would have an important significance for the theory. It would not only denote that the two emission processes are closely related as phenomena taking place within the same activator center but it would also necessitate a revision in the conception of the mechanism responsible for them. It would no longer be possible to contend that both processes involve the same ground state and that their excitation states are set at two different energy levels. On the contrary, it would make it appear that both emission processes are due to the release of excited electrons from the same excitation state and that the differences in energy content of the two emission bands are due to differences in the energy levels to which the excited electrons fall.

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7. J H. Schulman, R. J. Ginther and E. W. Claffy, *J.* (*and Trans.*) *Electrochem. Soc.*, **95**, 57 (1949).
8 F. J. Studer and A. Rosenbaum, to be published in *J. Optical Soc. Am.*, August (1949).

Recent Patents

(*Continued from page 41C*)

Cassanos, J. G., and Butler, K. H., 2,467,810, Barium Magnesium Lead Silicate Phosphor.
Pinner, W. L., 2,467,852, Electrolytic Sheet Metal Anode.
van Geel, W. C., and Esseling, L. A. L., 2,468,003, Method of Manufacturing a Selenium Blocking-Layer Cell.
Webster, H. G., 2,468,006, Electrolytic Cleaning of Metal.

April 26, 1949

Blue, R. D., Hunter, R. M., and Neipert, M. P., 2,468,022, Electrolytic Apparatus for Producing Magnesium.
Stateman, M. J., 2,468,131, Method of Manufacturing Rectifier Elements.
Cotton, W. J., 2,468,173, Apparatus for the Electrochemical Transformation of Materials.
Cotton, W. J., 2,468,174, Apparatus for Electrically Transforming Materials.
Cotton, W. J., 2,468,175, Apparatus for Electrochemical Transformation of Materials.
Denton, E. T., 2,468,176, Apparatus for Subjecting Material to the Action of Split Electrical Discharges.
Cotton, W. J., 2,468,177, Method of and Apparatus for Effecting the Electrochemical Transformation of Material in the Presence of Antenna Electrodes.
Hillier, J., 2,468,261, Gas Analyzer.
Brown, U. J., 2,468,357, Self-Energizing Electrolytic Corrosion Preventing Device.
Derksen, J. C., 2,468,430, Casing with Pushbutton Valve for Air Depolarized Cells.
van Geel, W. C., and Esseling, L. A. L., 2,468,527, Blocking-Layer Cell.

May 3, 1949

Low, F. S., 2,468,766, Recovery of Chlorine from Hydrogen Chloride.
Ovrebo, P. J., 2,468,775, Impedance Matched Thermocouple for Coaxial Conductors.
Strickland, H. A., Jr., 2,468,780, Stock Guide and Power Control for Electric Furnaces.
Jernstedt, G. W., 2,468,825, Plating.
Stareck, J. E., and Corliss, L. M., 2,469,015, Method and Compositions for Producing Surface Conversion Coatings on Zinc.
Klemperer, H., 2,469,231, Electrical Precipitator.
Mason, J. F., and Beebe, A. H., Jr., 2,469,237, Electrolytic Sealing of Anodized Aluminum Surfaces.
Calfee, J. D., and Florio, P. A., 2,469,290, Process for Making Tetrachlorodifluoroethane.

May 10, 1949

Levin, I., 2,469,393, Rectifier.
Rentschler, H. C., 2,469,410, Ultraviolet Lamp.
Fearon, R. E., 2,469,460, Radioactivity Measurement.
Russell, W. L., 2,469,461, Gamma-Ray Logging.
Russell, W. L., 2,469,462, Neutron Well Logging.
Russell, W. L., 2,469,463, Neutron Logging of Wells.
Mageoch, N. H., 2,469,470, Plating Machine.
Malki, M., Matzkin, B., and Goldman, A. L., 2,469,508, Electrical Accumulator with Tubular Electrodes.
Butler, E. M., 2,469,545, Self-Energizing Electrolytic Water Correction Device.
Jutte, W. B., 2,469,560, Indicator Plug.
Butler, E. M., 2,469,680, Electrolytic Water Correction Device.
Gresham, D. C., 2,469,689, Method of Making Apertured Metal Sheets.
Cooper, H. S., 2,469,715, Cobalt Base Alloy Composition.
Edlund, D. L., Oberle, T. L., and Strauss, J., 2,469,718, Alloys.
Hoffman, R. A., 2,469,727, Electrodeposition of Nickel.
Moore, W. E., 2,469,740, Arc Furnace with Lift and Swing Aside Roof.
Brockman, F. G., and Wescott, J. W., 2nd, 2,469,947, Production of Extremely Thin Filaments.
Williams, S. D., 2,470,010, Melting Iron in Electric Furnaces.

A Latent Resource

A sense of the esthetic is not a strong American virtue, if one is to judge by our littered streets and highways, and by our polluted rivers and beaches. Yet evidence appears now and then, showing that we are not entirely numb to our surroundings. A prominent executive, speaking some months ago to the Industrial Research Institute, pointed out that employees coming direct from a beautiful college campus often find the transition to grim factory walls and shabby industrial towns hard to take. "I sometimes think," he said, "it is best never to hire a man straight out of school, but to let him go to another company for a year or so, where he can learn that working for a living is not the joyful thing his professors may have painted it . . ." Whether or not the professors are to blame, there is little doubt that the tranquil atmosphere of the campus and the idealism of the classroom can be accused in some instances of poorly preparing students for the industrial scene.

One possible solution is to discard our shaded green campuses and portalled lecture halls in favor of closely-set units of stark functional architecture separated by concrete and cinder walks. Classes might be dismissed and assembled with the aid of a whistle or siren, and a few belching smokestacks erected here and there to help dilute the sunlight. Students from such an institution could easily make the transition to industry with but few qualms.

There is another approach to the problem, however, that is gaining headway. This may be described as the transformation of industry to the more gentle appurtenances of the college campus. Old-timers will shudder at the thought; yet the trend is already under way, and there are said to be real advantages to industry. Several companies, over the past few years, have shifted their research units and pilot-plant operations to spacious suburban areas. More industries are making a point of landscaped grounds and attractive, well-lighted buildings. Campaigns are now under way in New York, Pittsburgh, and other cities to reduce smoke, a technology being employed in which electrochemistry plays an important part. Congress has passed legislation marking the beginning of a drive to transform our rivers and harbors from the open sewers they are, to waterways more pleasant to the eye, more healthful to those living along the banks, and with rich areas for recreation.

And beyond this obvious necessity for cleaning up the dregs of our industrial civilization, far-seeing leaders of industry press still further for the basic ideas of a world worth living and working in. One significant step ahead is the experiment conducted at Sag Harbor, Long Island, by Charles Edison, President of Charles A. Edison, Inc. In this unspoiled, old-time whaling town, he has located the manufacture of small electric coils in an attempt to prove that industry, properly guided, can provide a benevolent influence on community life without altering the town for the worse, such as by the erection of slums, smokestacks, and nondescript factory buildings. Experiments of this kind may well spearhead a movement as auspicious in the industrial history of this country as the discovery and application of large-scale production.

A sense of beauty and proper proportion lies within the soul of every man. Properly nourished, it contributes to happiness and better living. Perhaps our schools and universities should keep prodding this latent resource of the people so that it may never be extinguished.

Current Affairs

Highlights of Forthcoming Chicago Convention

October 12, 13, 14, and 15, 1949

The program for the Chicago meeting, October 12th through 15th, includes a full quota of technical papers to be presented at the symposia sponsored by the Electro-Organic, Corrosion, and Electrodeposition Divisions. These symposia are to be supplemented by informal round-table discussions of specific problems sponsored by the Battery and Electro-Organic Divisions. In addition, there will be the usual Committee and Board meetings as well as luncheon programs, plant trips, ladies' program, and evening entertainment. For details of the complete program, reference should be made to the program booklet which has been mailed to the members.

Registration

Because October is a busy month for Chicago hotels, Convention-Committee Chairman C. A. Hampel urges all those contemplating attendance at the meeting to make their room reservations promptly if they have not done so on the postage-prepaid La Salle Hotel reservation cards which were mailed to the members. All room reservations are being handled directly by the hotel and reservation requests should *not* be addressed to the Chicago Committee. This will facilitate matters and avoid possible confusion.

Except for the Wednesday evening registration on the mezzanine, all functions will be held on the two upper floors of the hotel, and particularly on the 19th floor. Here, starting Thursday morning, will be located the registration desk and the lounges for both men and women. High-speed elevators to the 19th floor provide rapid service with all other floors of the hotel. A lounge is being provided on the 18th floor. It is immediately adjacent to one meeting room and will be connected by an announcer system to the 19th floor meeting room. As papers are to be pre-

NEWBERRY LIBRARY

This famous library is located on the near north side and devoted entirely to the housing of an extensive collection of books on the humanities with special collections on the history of printing and early Americana, particularly on the contacts between the Indians and the white people.

MUSEUM OF SCIENCE AND INDUSTRY

sented, they will be announced in the lounge.

Following the usual Committee and Board meetings scheduled for Wednesday, the technical sessions will start on Thursday morning, October 13th. There will be concurrent sessions of different divisions to permit ample time for the presentation and discussion of papers. Registration will start on Wednesday evening and those attending the meeting are urged either to send in their advance registration card (previously mailed to the members) or to register on Wednesday evening to avoid the crowd and consequent delay at the registration desk on Thursday morning. Tickets for all functions will be available at the registration desk starting on Wednesday evening.

Corrosion Symposium

The Corrosion Division has a well-rounded program of papers for its symposium. Their presentation will be scheduled for Thursday morning and afternoon. At the present writing, it appears that the papers at one of the sessions will be devoted largely to "Inhibition and Passivation."

Electro-Organic Symposium

The Electro-Organic Division, presenting its lengthiest program of papers, will open the technical sessions on Thursday morning. This symposium will continue throughout Thursday and on Friday will be concluded by a round-table discussion of industrial electro-organic processes, economic valuation of electro-organic processes, and other technological matters.

Electrodeposition Symposium

The sessions on electrodeposition are scheduled for Friday afternoon and Saturday morning. The electrodeposition papers cover a wide range of subjects. A considerable number of them are of direct interest to electroplaters and, therefore, a large attendance of the Chicago-area electroplaters is anticipated, particularly for the Saturday morning session. A short symposium devoted to chrome plating is planned. The special Electrodeposition Division luncheon on Saturday will be in honor of Dr. Frank C. Mathers, who will talk on the effect of unusual things in the electroplating and refining bath. Dr. A. G. Gray will give a short talk on the status of the revised edition of "Modern Electroplating." A short business meeting of the Division following the luncheon will terminate the formal part of the program. The balance of the afternoon will be given over to the informal discussions between individuals and groups that have proved so popular in the past. Not

only will this afford an excellent opportunity for the members of the Division to discuss their common problems, but it also will give them the opportunity to meet with the leaders of the operating electroplaters in the Chicago area. The latter have expressed a keen desire for such an informal meeting.

Battery Round Tables

On Friday morning, October 14th, the Battery Division, in addition to holding its annual business meeting at which officers for the coming year will be elected, is holding round-table discussions on "The Structure of Manganese Dioxide" and "Low Temperature Performance of Storage Batteries." The first of these will be presided over by Dr. J. N. Mrgudich, and the second will be directed by Dr. Eugene Willihnganz. These subjects are currently being much discussed in the dry-battery and wet-battery industries, respectively.

Plant Trips

On Thursday, the trip to the Armour Research Foundation will be made, as described more fully in the August JOURNAL. On Friday, a morning trip is to be made to the Lakeside Press, R. R. Donnelly & Sons Company, one of the largest printing houses in the world. This plant, which is close to the Loop, is one of the most outstanding of its kind and is nationally known. Although electrochemical operations at the plant will be of interest, many of the other operations are so novel that this plant visit should appeal to all who attend the meeting. On Friday afternoon, a trip will be made to the South Works of the Carnegie-Illinois Steel Corporation to see primarily the electric steel operations. The bus route to this plant is along the Lake Michigan shore and through the South Chicago park system for most of the way. Those who go will, therefore, have the opportunity of seeing this well-known and beautiful section of which Chicago is justly proud.

Luncheon Programs

An attractive program of luncheon activities has been arranged for all three days of the Convention. Dr. Otto Eisenschiml, one of Chicago's best known chemists and authors, will be the luncheon speaker on Thursday, October 13th. Always an interesting and entertaining speaker, he intends to "spin a yarn," half literary and half historical, concerning one of his experiences. The kindly, provocative humor and philosophy of his talks have an appeal, so that those who have heard him will anticipate hearing him again, and for those who have not, it will be a most pleasing experience. Dr. Eisenschiml's long record of accomplishments, including that of being the head of a successful business, is known to most of those whose activities are related to the chemical profession; but his activities are not limited to

DR. OTTO EISENSCHIML

the confines of the technical aspects of his profession. He has given much of his time to public service. For many years he has devoted much effort toward winning recognition by the public of the contributions of the chemist to society and in establishing proper recognition of chemistry as a profession. He has received many honors, and recently was awarded the Honor Scroll of the Chicago Chapter of the American Institute of Chemists. However Dr. Eisenschiml is probably better known to the public as an historian, and particularly for his published contributions on Abraham Lincoln. He has published several volumes which relate to the assassination of Lincoln.

This year the Joseph W. Richards Memorial Lecture, established in October, 1929, in honor of Professor Joseph W. Richards, first president and one of

the founders of the Society and for many years its secretary, is to be given. The luncheon program on Friday will feature this lecture.

On Saturday the special Electrodeposition Division luncheon will be in honor of Professor Frank C. Mathers of the University of Indiana, who has devoted a lifetime of research to the various phases of electrodeposition. The TRANSACTIONS of The Society bear witness to this as his name appears in most of the volumes since he became a member of the Society in 1904, either as the contributor of an original paper or as a participant in the discussions of other papers. As a result of this outstanding record, he was elected President of The Society for the 1940–1941 term. In view of Dr. Mather's many contributions to the electroplating art, this luncheon is of particular appeal to the many electroplaters of the Chicago area. As noted elsewhere Professor Mathers will talk on one of his favorite subjects, that is, the effect of unusual things in the electroplating and refining bath.

The Thursday dinner and evening program will appeal to a variety of tastes. There will be refreshments, good food, entertainment, and dancing, but *no* speeches. The spacious ballroom on the 19th floor of the hotel provides the proper setting for the varied program of special entertainment, including music by the well-known Ben Sharp and his orchestra. He also will furnish the music for the dancing which follows the entertainment features.

A Word to the Wives

Mrs. C. A. Hampel, chairman of the Ladies' Committee, urges all ladies to be on hand promptly on Thursday morning for the Kaffee Klatsch at 10 A.M. on the 19th floor. Coffee will be served in a private suite where the ladies will have the opportunity of meeting old and new

BROOKFIELD ZOO, LION DEN

In addition to the newer Brookfield Zoo, a smaller but excellent zoo is also maintained in close-to-the-loop Lincoln Park.

friends as well as the Chicago Committee. They will learn about the details of the program which has been provided, including the Chicago-harbor boat trip on Friday morning, the special luncheons on Thursday and Friday, the trip to the Oriental Institute on Friday afternoon, and the dinner and entertainment for Thursday evening. General information about Chicago will be available at that time for those who are interested in using the unassigned time after 3 P.M. on Thursday for trips of their own choice.

Section "Q"

Special entertainment has not been provided for Friday evening so that members and guests will be free to attend any of the many interesting places for eating or entertainment found in Chicago, some of which are in the Hotel La Salle. For those who desire to while away the evening visiting with cronies and friends, or swapping experiences with other electrochemists, the Chicago Committee is providing a room on the 18th floor having the proper Section "Q" atmosphere and appurtenances. It will be open all evening until there are no more "holes in one" to be told about, or no further problems, electrochemical or political to be solved. Come and go whenever you please.

Fourth Empire Mining Congress

Sixteen countries of the British Commonwealth, including Canada, Australia, New Zealand, South Africa and India, and eleven other countries, including the United States, were represented at the Fourth Empire Mining and Metallurgical Congress held in Great Britain from July 9th to 23rd. About 600 delegates and members attended the Congress in London (Grosvenor House, Park Lane) and 300 took part in the technical sessions in Oxford (Oxford Union Society) and visited the various excursion centers in England, Scotland, and Wales.

The chief object of the Congress was to enable scientists, engineers, and others concerned in the mining and metallurgical industries to discuss technical progress and problems, including the development of the mineral resources of the Commonwealth.

Forty papers were presented and discussed at sessions in the debating hall of the Oxford Union from July 13th to 16th, the subjects covering mineral resources, modern methods of prospecting (including aerial survey), the effects of heat and humidity on workers in deep mines, petroleum production, coal mining, mineral dressing and metallurgical research, development, and fabrication.

"The Metallurgical and Mining Aspects of Atomic Energy" was the subject of an evening lecture in Oxford by Sir John Cockroft, Director of Research on Atomic Energy, Ministry of Supply; Dr. Charles Camsell, Canada, lectured on "Miners as Pioneers"; and Dr. W. Hume-Rothery, lecturer in Metallurgical Chemistry, University of Oxford, spoke on "The General Theory of Metals and Alloys."

After the Oxford sessions, the delegate and members split into four parties for visits to industries and places of interest centered on Cardiff, Cornwall, Edinburgh, and Newcastle-upon-Tyne.

Pacific Meeting of AIEE

The Pacific General Meeting of the AIEE was held this year in San Francisco from August 23rd to 26th inclusive. As this is a Centennial year in California, various celebrations and events were held in San Francisco which added to the visitors' enjoyment of this already fascinating city.

The Fairmont Hotel was convention headquarters. Some highlights of the program, social and otherwise, were:

A trip to Palo Alto, a tour of the city and a cruise in the Bay, and a visit to San Francisco's Chinatown, which is the largest outside the Orient.

A visit to the University of California Radiation Laboratories. Here was seen the world's largest cyclotron, ten times more powerful than any other nuclear accelerator.

The technical program for the Pacific Meeting included several sessions on "Power Generation and Distribution" and "Air Transportation." Single sessions were held on "Electronics and Communications," "Electronics and Science," and "Industrial."

Volumes 87 and 89 Wanted

We have had a number of requests for Volumes 87 and 89 of the TRANSACTIONS of The Electrochemical Society, which we are unable to supply.

If any members, no longer using these volumes, would like to dispose of them at the second hand rate, please write The Electrochemical Society, Inc., 235 West 102nd Street, New York 27, N. Y.

Personals

JAMES H. SMITH, past chairman of the Chicago Section of the Electrochemical Society, has been transferred by the Metals Refining Company from the Research Division at Hammond, Indiana, to Technical Sales with the New York office.

Mr. Smith was recently sworn in as a Captain in the Chemical Corps Reserve of the U. S. Army.

ROBERT E. HULSE, formerly associated with Du Pont's Niagara Falls plant, is now Director of Research for National Distillers Products Corporation. The Research Division, located at Cincinnati, Ohio, also will carry out research projects for National Distillers Chemical Corporation, a wholly owned subsidiary, whose entry into the sodium and chlorine field was recently announced.

SAM R. FARIS is now engaged as Research Chemist in the Field Research Laboratories of the Magnolia Petroleum Company, Dallas, Texas. Mr. Faris had been Instructor of Chemistry at the University of Oklahoma, Norman, Oklahoma.

C. K. MOREHOUSE has joined the Research and Development Division of the Winchester Repeating Arms Company in New Haven, Connecticut. Dr. Morehouse was previously with the Western Cartridge Company, East Alton, Illinois.

WALDEMAR P. RUEMMLER succeeded Mr. G. E. Johnson, upon his retirement August 1, 1949, as Manager of the East Chicago plant of The Eagle-Picher Company. Mr. Ruemmler joined The Eagle-Picher Company in 1948 and has been successively in charge of Research and Development, and Acting Superintendent of the East Chicago plant. Prior to his present affiliation, Mr. Ruemmler was associated with the Battelle Memorial Institute, and is a former Weston Fellow of The Electrochemical Society.

HERBERT FLEISCHMANN, formerly of Covington, Kentucky, is now with the May Institute for Medical Research, Cincinnati, Ohio.

EDWARD L. HAENISCH has been appointed Professor of Chemistry and Chairman of the Chemistry Department at Wabash College. Dr. Haenisch goes to this position from Villanova College where he has been engaged in a similar capacity for the past thirteen years.

REGINALD S. DEAN, metallurgical engineer and consultant, Washington, D. C., has moved his offices to 6000-34th Place, N. W., Washington 15, D. C. Dr. Dean is also president of R. S. Dean Laboratories, Inc., which has just moved into its own laboratory and office building at 5810-47th Avenue, Riverdale, Maryland, just outside Washington.

MOGENS E. CHRISTIANSEN of General Dry Battery Company, located at Dubuque, Iowa, has transferred to this company's plant at 13000 Athens Avenue, Cleveland, Ohio.

REV. GEORGE O. TWELLMEYER, for the past year an instructor in the Chemistry Department of Loyola University, New Orleans, Louisiana, has returned to Columbia University to continue work on his doctorate.

Sven Bergstrom Heads New York Firm

Sven Bergstrom, formerly of Stockholm, Sweden, is now President of Nife, Incorporated, 165 Broadway, New York City. Mr. Bergstrom was sent here by his company, Svenska Ackumulator Aktiebolaget Jungner, earlier in the year to establish the New York branch. The chief products of the company are nickel cadmium storage batteries and certain precision instruments, including a marine device for measuring speed and distance.

Merlub-Sobel to Discuss Israeli Industries

Dr. M. Merlub-Sobel, associate professor of chemical engineering in the Hebrew Institute of Technology, Haifa, Israel, will return to America for a short visit during September and October, primarily to deal with the many inquiries which have come to him as Chairman of the American Technion Society (the American affiliate of the Hebrew Institute of Technology) regarding scientific and technological problems in Israel. He will be available, to all who may be interested, at the American Technion Society, 154 Nassau Street, New York, during that period, for discussion of Israeli chemical and metallurgical industries.

Book Review

INDENTATION HARDNESS TESTING by Vincent E. Lysaght. Published by Reinhold Publishing Company, New York, 1949. 288 pages, $5.50.

By discussing the functioning of hardness testers and possible sources of errors, and their magnitude, the author of this valuable new book establishes a basis for an improved interpretation of hardness data. The book contains numerous illustrations of the various types of hardness testers and their application to testing problems.

The section on microhardness testing ably summarizes the published literature on the subject. Mr. Lysaght explains how the various types of testers have been used to determine microhardness of very thin materials, shallow electroplated layers, case-hardened materials, nonmetallics and microconstituents. To supplement these explanations he uses test data obtained in industrial and research laboratories. For example, he presents measurements made with a Tukon Tester on electrodeposits of cadmium, silver, zinc, copper, nickel and chromium.

This book should prove useful as an introduction or reference for anyone using hardness as a research or production tool. It fulfills Mr. Lysaght's "intention to convey the idea that there is more in hardness testing than the mere application of a load to a ball, cone or pyramid."

JOSEPH J. CONNELLY

Future Meetings of Other Organizations

American Standards Association, annual meeting, Waldorf-Astoria Hotel, New York City, October 11–14.

American Gas Association, annual convention, Chicago, Illinois, October 17–20.

American Trade Association Executives, annual meeting, Greenbrier Hotel, White Sulphur Springs, West Virginia, October 24–26.

Thirty-seventh National Safety Congress, Chicago, Illinois, October 24–28.

National Electrical Contractors Association, 1949 annual convention, Houston, Texas, November 8–11.

National Electrical Manufacturers Association, Chalfonte-Haddon Hall, Atlantic City, New Jersey, November 14–18.

New Members

At the meeting of the Board of Directors held on July 23, 1949, at the office of The Electrochemical Society, Inc., 235 West 102nd Street, New York City, the following were elected to membership:

JOHN F. AICHER, mailing add: c/o E. A. Wilcox Co., 277-7th Street, San Francisco 3, California (Electrothermic)

JOHN H. ALLAN, Oxford Paper Co., mailing add: 825 Somerset St., Rumford, Maine (Corrosion, Alkali and Chlorine)

CHARLES EDWARD AULL, Burgess Battery Co., mailing add: 538 W. Evelyn St., Freeport, Illinois (Batteries)

MALCOLM S. ANDERSON, mailing add: C. G. Conn, Ltd., Elkhart, Indiana (Electrodeposition)

DONATO J. BRACCO, Sylvania Electric Products, Inc., mailing add: 29-19 201st St., Bayside, New York (Electronics)

DONALD B. CAMERON, mailing add: National Carbon Co., Inc., P.O. Box 6087 Cleveland 1, Ohio (Battery)

CHARLES E. CAMPBELL, Hanson-Van Winkle-Munning Co., mailing add: 2800 W. Grand Blvd., Detroit 2, Michigan (Electrodeposition)

WALTER E. CLARK, Chem. Dept., University of Wisconsin, mailing add: Dept. of Chemical Engineering, Missouri School of Mines and Metallurgy, Rolla, Missouri (Electrodeposition)

GAIL F. DAVIES, mailing add: c/o Brush Laboratories Co., 3714 Chester Ave., Cleveland, Ohio

JAIME ESTRUCH-BATLLE, Empresa Nacional Autocamiones S. A., mailing add: Padre Claret 201, Barcelona, Spain (Corrosion and Electrodeposition)

STANLEY GARFINKEL, Coop. student, University of Cincinnati, mailing add: 3241 Glendona Ave., Cincinnati, Ohio (Electrodeposition)

ROBERT J. GINTHER, Naval Research Laboratory mailing add: 145 Danbury St. S.W., Washington 20, D.C. (Electronics)

MADAN G. GUPTA, mailing add: H. B. Technological Institute, Nawabgunj, Kanpur, India (Theoretical Electrochemistry and Electrodeposition)

EARL T. HAYES, mailing add: c/o U.S. Bureau of Mines, Albany, Oregon (Corrosion and Electrothermics)

CHARLES W. JEROME, mailing add: Sylvania Electric Products, Inc., 60 Boston St., Salem, Mass. (Electronics)

RICHARD V. KESSELI, Columbia University student, mailing add: Whitin Road, Sutton, Massachusetts (Electrodeposition)

WILLIAM H. KOLINS, mailing add: Frontier Chemical Co., Box 578 Denver City, Texas (Industrial Electrolytic)

ALBERTINE KROHN, mailing add: University of Toledo, Toledo 6, Ohio (Theoretical Electrochemistry and Electrodeposition)

JULIUS E. LILIENFELD, Power Condenser and Electronics Corp., mailing add: P.O. Box 226, Saint Thomas, Virgin Islands, U.S.A. (Theoretical Electrochemistry, Corrosion, Electrodeposition, Electronics and Dielectrics)

ALFRED H. MCKEAG, General Electric Company Research Labs., mailing add: 51 Spencer Road, N. Wembley, Middlesex, England (Electronics)

EMERY MESCHTER, mailing add: E. I. du-Pont de Nemours & Co., Towanda, Pennsylvania (Electronics)

MARCEL POURBAIX, University of Brussels, mailing add: 65 Rue J'Arlon, Brussels, Belgium (Corrosion and Theoretical Electrochemistry)

EUGENE M. OLMSTED, The Udylite Corporation, mailing add: 8073 Mandalay, Detroit 4, Michigan (Theoretical Electrochemistry)

CARL W. SCHEDLER, Drysdale and Schedler, Industrial Engineers, mailing add: 58 Sutter Street, San Francisco 4, California (Industrial Electrolytic)

JAMES H. SCHULMAN, Naval Research Lab., mailing add: 4303 Nichols Ave. S.W., Washington 20, D.C. (Electronics)

FRED A. SHIRLAND, JR., National Carbon Company, Inc., mailing add: 6209 Ridge Road, Parma, Cleveland 9, Ohio (Battery)

CHRISTOPHER C. SILSBY, JR., Diamond Alkali Co., mailing add: 761 East 258 Street, Euclid 23, Ohio (Industrial Electrolytic)

ARTHUR L. SMITH, mailing add: RCA Victor Division, New Holland Pike, Lancaster, Pennsylvania (Electronics)

RAYMOND S. STEWART, mailing add: Titanium Alloy Mfg. Division, National Lead Co., Niagara Falls, New York (Corrosion, Electrothermic and Theoretical Electrochemistry)

MILTON A. TREUHAFT, Hudson Electrochemical Co., mailing add: 240 Leslie Street, Newark 8, New Jersey (Corrosion Electronics and Industrial Electrolytic)

GEORGE R. WATSON, Norton Company, mailing add: Box 127, Chippawa, Canada (Electrothermic)

WILLIAM R. WATSON, mailing add: Sylvania Electric Products, Inc., P.O. Box 6, Bayside, New York (Electronics)

STANLEY WAWZONEK, mailing add: Department of Chemistry, State University of Iowa, Iowa City, Iowa (Organic Electrochemistry)

Reinstatement

RAYMOND STRICKLEN, JR., mailing add: Allied Research Products, Inc. 4004 E. Monument Street, Baltimore 5, Maryland (Corrosion and Electrodeposition)

Employment Situations

Please address replies to box shown, c/o The Electrochemical Society, Inc. 235 W. 102nd St., New York 25, N. Y

Positions Available

ELECTROCHEMIST, B.S. or M.S., two years' industrial experience or more, age up to 30, for research and development work on storage batteries. Please submit résumé with salary desired. *Reply to Box A-213.*

ELECTROCHEMIST for research. Salary range is from $3,000 to $7,000 a year, depending upon qualifications. Location—Washington, D. C. *Reply to Box A-214.*

Positions Wanted

ELECTROMETALLURGIST, production and development. B.S. in electrochemical engineering, M.S. in metallurgy. Four years production and development experience in the electrolytic reduction of aluminum; one year, lithium; one year, sodium. *Reply to Box 333.*

Future Meetings of The Electrochemical Society

Chicago, October 12-15, 1949

Cleveland, April 19-22, 1950

Buffalo, October 11-14, 1950

St. Louis, Spring, 1951

Detroit, Fall, 1951

Recent Patents

Selected for electrochemists by Fred. W. Dodson, Chairman of the Patent Committee, from the Official Gazette.

April 12, 1949

Wintermute, H. A., 2,467,068, Electrical Precipitation.
Mochel, J. M., 2,467,144, Electrically Conducting Refractory Body.
Schormuller, A., and Windecker, C. E., 2,467,159, Method of Producing Fused Beryllium Oxide.
Picard, R. G., 2,467,224, Neutralization of Electrostatic Charges in Electron-Optical Instruments.

May 10, 1949

Hensel, F. R., 2,470,033, Spark Plug.
Hensel, F. R., Wiggs, J. W., and Heil, V. E., 2,470,034, Electric Contact Formed of a Ruthenium Composition.
Low, F. S., 2,470,073, Electrolytic Cell and Method of Operating Same.

May 17, 1949

Martin, H. R., 2,470,104, Battery Post Clamp.
Gray, R., 2,470,163, Plate Support for Electric Accumulators.
Leverenz, H. W., 2,470,173, Phosphor Materials.
MacKenzie, K. W., 2,470,356, Electrical Precipitator.
Williams, F. E., 2,470,449, Phosphor Materials.
Wood, E. J., 2,470,451, Phosphors.
Leverenz, H. W., 2,470,627, Phosphor.
Schulman, E. L., and Beiler, A. C., 2,470,653, Resistance Thermometer.
Gordon, H. L., 2,470,741, Automatic Agitator for Apparatus Subjecting Liquid to Electrical Potential Between Electrodes.

May 24, 1944

Alban, C. F., 2,470,753, Thermostatic Laminated Metal.
Jernstedt, G. W., and Ceresa, M., 2,470,775, Electroplating Nickel and Cobalt with Periodic Reverse Current.
Post, C. B., and Eberly, W. S., 2,471,079, Glass Sealing Alloy.
Post, C. B., 2,471,080, Austenitic Steel Having High Hot Hardness.
Schulman, J. H., 2,471,082, Calcium Cadmium Silicate Phosphor.
Christen, V. H., 2,471,094, Storage Battery Filling Device Support.
Bunn, E. S., 2,471,385, Zinc Base Alloys.

May 31, 1949

McIntyre, G. H., and Skinner, R. E., 2,471,531, Electrode.
Rittenhouse, J., and Peters, M. F., 2,471,585, Explosion-Proof Battery and Filler Plug.
Calkin, F. G., 2,471, 607, Facsimile Recording Papers.
Kurtz, J., 2,471,630, Pressed and Sintered Oxidation Resistant Nickel Alloys.
Stelmack, S., 2,471,660, Storage Battery with Level Indicator.
Schmidt, W. G., 2,471,781, Electric Accumulator of the Bipolar Type.
Rau, D. W., 2,471,898, Reclamation of Selenium Rectifier Cells.
Spruance, F. P., Jr., 2,471,909, Method and Materials for Producing Coated Aluminum.
Stoltz, G. E., Erbe, J. R., and Geiselman, R. A., 2,471,912, Control of Electrolytic Processes.
Willson, K. S., and Ellis, D. G., 2,471,918, Electrodeposition of Copper.
Lowe, S. P., Long, G. W., Kent, G. H., and Downes, K. W., 2,471,965, Method of Electrolytically Producing Zinc of High Purity.

June 7, 1949

Oswald, M. V., 2,472,171, Method for Producing Electrodes for Electric Arcs.
Mason, R. B., 2,472,304, Method of Etching Aluminum.
Kearsley, W. K., Winslow, A. F., and Liebhafsky, H. A., 2,472,376, Electric Cell of the Immersion Type.
Lawson, H. E., 2,472,379, Battery Electrolyte with Phosphoric Acid.
Boyle, E. J., 2,472,402, Zinc-Copper-Titanium Alloys.
Kiefer, G. C., 2,472,592, Inorganic Insulating Coating for Electrical Steel Sheet and Strip.
Poland, F. F., 2,472,612, Electric Furnace.
Poland, F. F., 2,472,613, Electric Resistance Furnace.
Raspet, A., 2,472,759, Thermopile for Measuring Air Temperatures.
Ratchford, H. L., 2,472,760, Electrode for Electron Discharge Devices.

June 14, 1949

Bowerman, E. R., Jr., 2,472,786, Method of Pickling Metal Contact Surfaces.
Evans, W. G., and Schaefer, W. C., 2,472,796, Anode Rod for Plating Tanks.
Dahl, A. I., 2,472,808, Thermocouple Junction with Radiation Shield.

Feature Section

Lantern Slides for Presenting Technical Papers

M. L. Holt

Lantern slides that are carefully prepared and well organized are a worthwhile aid in the presentation of technical papers. They provide the speaker with an outline of his subject material, which can be important since his time is usually limited, and obviously they help the audience follow the presentation. The purpose of this article is to offer a few constructive suggestions regarding the preparation and use of lantern slides, and particularly temporary slides, for presenting papers at meetings of our Society. Reference is made only to regular size slides, 3¼ by 4 inches, but the suggestions are also applicable to smaller slides which are often more convenient to use.

Types of Lantern Slides

There are several kinds of lantern slides which may be used. A combination of ordinary permanent photographic slides and temporary typed slides is quite effective. Permanent slides, most conveniently prepared by regular photographic laboratories, are best for reproduction of tables, charts, graphs, etc., which are available from the manuscript. Temporary slides are particularly useful for outline statements about the subject material, data summaries, conclusions, etc. Such slides not only assist the listener in comprehending the material being presented, but they likewise assist the speaker in his presentation. An important feature, much appreciated by both speaker and audience, is that it is not necessary to darken the room during the presentation.

One type of temporary slide, named Radio-Mat,* consists of a cellophane sheet between colored "carbon" paper which in turn is inserted in a mask envelope. The material for the slide is typed in the space bordered by the mask after which the carbon paper and backing are discarded. The transparency and mask thus obtained are then inserted between two clean glass plates (discarded lantern slides) which are hinged together with slide binding tape. Then the upper edges of the glass plates are bound together with a short strip of slide tape and the temporary lantern slide is ready for use.

M. L. Holt

Preparation of Material

The selection and preparation of material to be presented on lantern slides requires reasonable care and thought. Obviously, only the main points of a manuscript can be presented in a short talk, so careful selection is necessary. Permanent slides, made directly from the tables and figures of the manuscript, should be provided with satisfactory titles and legends. Slides of large tables of data should be avoided if possible; if such a slide is used it should be followed by a temporary slide giving statements of trends or significant results.

Although photographic slides are best made from the original graphs and draw-

* Manufactured by Radio-Mat Slide Co., Inc., Daytona Beach, Florida.

ings which have been prepared for the manuscript, copies of these figures made by a duplicating process, such as the Ozolid white print process, also serve very well for this purpose. It is a good practice and a saving of time to prepare only a single original drawing of each of the manuscript figures and then have three Ozolid copies made of each one. Two sets of these copies can be included with the two carbon copies of the manuscript which are sent to the editor along with the original and a third can be used for the author's manuscript copy and for the preparation of lantern slides. Since titles are separated from the figures in the manuscript, the title and explanatory data will have to be typed on the copy used for making the lantern slide.

Preparation of Temporary Slides

The temporary slides can be prepared by a typist provided the material for each slide is well organized. Statements should be clear and concise to fix the attention of the audience and still allow for expansion by the speaker in his oral presentation. The space on the Radio-Mat will conveniently handle twelve lines of thirty-three letters and spaces each, but crowding should be avoided. It is better to use a few extra slides than to have too much material on one slide. Single spacing is quite satisfactory although it is well to separate individual items or statements by a double space. Directions on the Radio-Mat specify that the typewriter ribbon should be thrown off when the slide material is being typed but the typist will probably prefer to use the ribbon. Care should be taken to insert the Radio-Mat in the typewriter with the thumb marker in the lower left hand corner so that when the transparency and mask are put upside down between the glass plates this marker will be on the upper right hand corner of the completed slide. In a well-prepared slide, the transparency will be centered in the mask border and the typed lines will be parallel to the bottom edge of the glass plates.

Number of Slides

The total number of slides to be used for presenting a paper will depend on the time allotted to the speaker. An excessive number of slides should be avoided, as rushing through the material may defeat their purpose. Twelve to fifteen slides will serve for a presentation time of about twenty minutes. The first slide should give a statement of the problem along with the general purpose of the work. This can be followed by a slide indicating previous significant work on the problem but avoiding details. If time is very limited, this material should not be given. If the chemistry involved in the work is expected to be unfamiliar to many of the audience, it is of value to summarize this information on one of the introductory slides. Then it is well to outline the general plan of the experimental work and follow this with brief statements about any special experimental techniques and apparatus. Again details should be avoided as these can, if necessary, be supplied by the speaker.

After presentation of the experimental results by such slides as seem required, the conclusions and the significance of the work should be given. A very small label glued to each lantern slide in the thumb marker position is a convenient place for the slide number and is also an aid to the lantern operator. It should be mentioned that Radio-Mats can be used for simple graphs and diagrams which may not be available from the manuscript for making permanent slides.

This article has not described the technique of making photographic lantern slides because it is assumed that regular facilities are available for this purpose. There are a number of published articles on the general subject of lantern slides, two of which are: "Preparation of Lantern Slides without a Camera" by L. A. Goldblatt and J. E. Bates, *J. Chem. Ed.*, **17**, 462 (1940), and "Preparation of Lantern Slides" by F. J. Antwerpen, *Ind. Eng. Chem.*, **21**, 1445 (1943).

Plan now to attend

The 96th Meeting of The Electrochemical Society

at the La Salle Hotel in Chicago

October 12, 13, 14, and 15, 1949

Let the Other Fellow Do It

In all democratic organizations there is a tendency to let other people do the work, make the decisions, and, in general, determine the policy of the group. As this is true, to a certain extent, within our own Electrochemical Society, we want to take this opportunity to appeal to the membership at large to take a more active interest in the workings of the Society.

Each year at our spring convention, the annual business meeting is held, at which time reports of the National Officers are made and results of elections are announced; by constitution, "Business affecting the organization of the Society shall be transacted only at the annual meetings." Last spring, in Philadelphia, it was very difficult to get a quorum of fifty members to attend the annual business meeting. This would not have been surprising if only routine business had been on the agenda, but, radical changes in the constitution were to be approved. These changes were of such a nature that the whole future of the Society would be affected. However, even this was not enough of an incentive to attract more than a small fraction of the members present in the hotel at that time.

No doubt the reason for this attitude of the general membership is that the Board of Directors is in a better position to know what is best for the Society. In many cases this may be true, but, if the rank and file of the membership do not take enough interest in the organization to attend the annual meeting, how can the Board determine the wishes of these members?

The principal reason for discussing this topic now is that the Board of Directors has just authorized some sweeping changes in publication policy for the near future. For one thing, a new method for handling oral discussion is being tried at the Chicago meeting, in the interest of economy and improved printed discussions. There no doubt will be many who will not approve of this system. To these people we say, let your thoughts be known and, if there is merit in them and enough people agree with you, your ideas will be used.

Starting next January, our JOURNAL will accept advertising. This change can mean a greatly reduced publication cost, resulting in the individual member receiving more for his money—but such a venture will be successful only if we have the working support of the entire membership.

Let's stir ourselves out of the frame of mind that says "let the other fellow do it" and all enter into active participation in the affairs of The Electrochemical Society.

HENRY B. LINFORD

Current Affairs

AAAS Holds 116th Meeting in December

Of special interest to all those engaged in scientific work is the 116th Meeting of the American Association for the Advancement of Science, to be held in the Penn Zone hotels of New York, December 26th to 31st inclusive. All seventeen sections and subsections and 53 societies are participating, and there are more exhibitors than ever before for the Annual Science Exhibition. The attendance is expected to be the largest in the Association's 101-year history.

The American Association for the Advancement of Science was founded in 1848 and is the only national body representative of all the sciences. With its affiliated and associated societies, and state academies of science, it is the largest and most influential scientific organization in the world. The Association has about 45,000 individual members. About one quarter of the membership have become fellows through their scientific contributions and attainments.

The purpose of the AAAS is not only to further cooperation among scientists in all the diverse fields, but also it is increasingly concerned with the improvement of human welfare and in a better public understanding of the interrelations of science and human progress. The sections are broad enough to include not only all professionally trained scientists who appreciate the place of science in our contemporary civilization, but any person interested in science who wishes to keep informed, and who is concerned with the proper integration of science and human society. With great governmental research agencies on the increase and impending social legislation with scientific aspects, more than ever a strong, unified scientific association, representative of the clearest thinking in science, is needed.

The headquarters hotels for the meetings are the Statler, New Yorker, McAlpin, Governor Clinton, and Martinique.

The Annual Science Exhibition will be held in the Penn Top and the Salle Moderne of the Hotel Statler. A large number of firms and organizations of service to science have arranged to exhibit, and this event is one of the highlights.

All members of The Electrochemical Society are invited to attend the sessions, the Science Theatre, and the special events. There will be symposia on Physics, Botany, Zoology, Science in General Education, and the Improvement of the Teaching of Science on the College Level—all contributors are outstanding authorities.

For full details of registration, program, hotel reservations, etc., write to the *American Association for the Advancement of Science*, 1515 Massachusetts Avenue, N. W., Washington 5, D. C.

Faraday Discussions

A General Discussion on "Chromatographic Analysis" was held by The Faraday Society at the Department of Chemistry, The University, Reading, September 22nd to 24th.

The program was arranged under the following heads:

Section I—Physicochemical Principles and their Utilization.

Section II—Applications (*a*) Inorganic, (*b*) Organic and Biochemical.

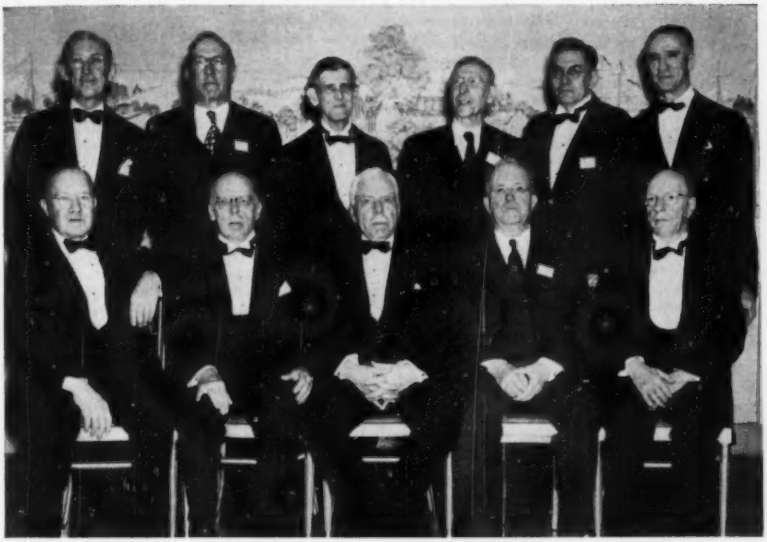
About 30 papers were presented for discussion and, according to the procedure adopted, they were issued in advance of the meeting. The authors then devoted five minutes to review the matters which they deemed merited special attention. Following this, the subject was open to the discussion.

Members and visitors from many European countries, Australia, and the United States attended the Discussion.

A.I.Ch.E. to Meet in Pittsburgh

The 1949 annual national meeting of the American Institute of Chemical Engineers will be held in Pittsburgh, Pa., December 4th to 7th inclusive, with headquarters at the William Penn Hotel. A varied and interesting program of technical papers has been arranged, along with several symposia on timely subjects of special interest to chemical engineers and technical men in general.

The symposia will include: Panel Discussions on the Present Status of Professional Legislation, Corporation Training of Young Engineers, Industrial Waste Disposal, Atomic Energy, and Vapor-Liquid Equilibria.



FORMER SOCIETY PRESIDENTS WHO ATTENDED THE PHILADELPHIA CONVENTION
Seated, left to right, Hiram S. Lukens, Colin G. Fink, Lawrence Addicks, Frank C. Mathers, William G. Harvey. Standing, left to right, R. M. Burns, A. T. Hinckley, H. Jermain Creighton, William C. Moore, George W. Heise, James A. Lee.

Scientific Research Promoted in South

In a plan to further develop and promote the increasing scientific research projects in the South today, the Southern Association of Science and Industry, Inc., Atlanta, Georgia, has adopted as its official publication the new *Journal of Southern Research*.

The *Journal*, which was launched early in the year, will furnish scientific members of the Association with a long-needed medium for recording their work. At the same time it will enable business men to keep abreast of technical developments in the Southern area.

Dr. Stewart J. Lloyd, President of the Association, and Dean of the University of Alabama's School of Chemistry, Metallurgy, and Ceramics, regards this as "another step in the Association's campaign to bring about a closer relationship between representatives of science and industry."

H. McKinley Conway, Jr. is editor of the *Journal* and the Board of Technical Advisors for the publication includes many leading research directors in the South.

Future Meetings of Other Organizations

American Standards Association, annual meeting, Waldorf-Astoria Hotel, New York City, October 11–14.

American Gas Association, annual convention, Chicago, Illinois, October 17–20.

American Trade Association Executives, annual meeting, Greenbrier Hotel, White Sulphur Springs, West Virginia, October 24–26.

Thirty-seventh National Safety Congress, Chicago, Illinois, October 24–28.

National Electrical Contractors Association, 1949 annual convention, Houston, Texas, November 8–11.

National Electrical Manufacturers Association, Chalfonte-Haddon Hall, Atlantic City, New Jersey, November 14–18.

Personals

CARSTEN STEFFENS has resigned as Assistant Director of the Stanford Research Institute, Stanford, California, to take a position as Associate Professor of Chemistry at the University of New Mexico, Albuquerque, New Mexico.

JAMES A. RABBITT, Far Eastern Representative of the International Nickel Company, Inc., New York, N. Y., has returned to Japan where he is engaged in a market study of the Far East for his company. Mr. Rabbitt's headquarters are in Tokyo; this is his second trip to the Orient since the war, having returned to this country last winter.

A. E. PAVLISH became Technical Director of the Kelly Island Lime and Transport Company, with offices in the Leader Building Cleveland, Ohio, as of September 1st. Mr. Pavlish was formerly a member of the supervisory research staff of Battalle Memorial Institute, Columbus, Ohio.

WILLIAM E. SHAW is now with the Titanium Alloy Manufacturing Division of the National Lead Company at Niagra Falls, New York. Mr. Shaw had been with the National Lead Company's Research Laboratories in Brooklyn, New York.

ERNEST RAMIREZ, who has been located in Monterry, N. L., Mexico, is now at the Graduate School of Illinois Institute of Technology, Chicago, Illinois.

MAURICE FRIEDMAN has been named Vice-President of the National Catalytic Battery Company, St. Paul, Minnesota. Mr. Friedman had been connected with the P. R. Mallory Company at Tarrytown, New York.

Future Meetings of The Electrochemical Society

Cleveland, April 19-22, 1950

Buffalo, October 11-14, 1950

St. Louis, Spring, 1951

Detroit, Fall, 1951

Letter to the Editor

Dear Sir:

I have before me Dr. H. C. Froelich's Letter to the Editor in the January issue of this JOURNAL. It seems to me that the suggestion to widen the scope of The Electrochemical Society will meet with the warm acclaim of many a specialist. For we all are specialists, but should never forget the universal texture into which our yarn is woven. Dr. Froelich thinks of an American analogue to the Faraday or Bunsen Societies. Dr. Ferguson, in his recent article, expresses similar views.

If this attitude is taken seriously, why should it not be indicated by frankly saying so, i.e., by changing the name of The Electrochemical Society? I cannot think of a name more symbolic of a broad-minded program than that of "Willard Gibbs Society."

HANS M. CASSEL
Pittsburgh, Pennsylvania

New Members

At the meeting of the Executive Committee held on August 9, 1949, at the office of The Electrochemical Society, Inc., 235 West 102nd Street, New York City, the following were elected to membership:

PETER EUSTIS, mailing add: c/o Virginia Smelting Co., West Norfolk, Virginia (Theoretical Electrochemistry, Alkali and Chlorine, and Electrodeposition)

PETER J. FERRARA, mailing add: National Distillers Chemical Corp., 120 Broadway, New York, N. Y. (Industrial Electrolytic)

JULES MOYNS, mailing add: Ste Pile Leclanche, Chasseneiul du Poitou, Vienne, France (Batteries)

SCHRADE F. RADTKE, E. I. du Pont de Nemours & Co., Inc. mailing add: 44 D Court Drive, Lancaster Court, Wilmington, Delaware (Theoretical Electrochemistry, Corrosion, Electrodeposition, Electrothermics, and Power)

M. K. T. REIKIE, Tin Processing Corp., mailing add: 520 Avenue C, La Marque, Texas (Electrothermic and Industrial Electrolytic)

Book Reviews

ELECTROPLATING ON ALUMINUM AND ITS ALLOYS by T. A. Hood. Published by Commonwealth of Australia, Department of Supply and Development, Defense Research Laboratories, 1947. 42 pages. (Copies of this publication may be obtained free of charge by writing to the publisher at Private Bag No. 4, P. O., Ascot Vale, W. 2, Victoria, Australia.)

The importance of electroplating on aluminum in present-day industrial and defense technology prompted the compilation of this manual and bibliography of 82 references on the subject.

The text consists of a selective list of 82 references chronologically arranged for the years 1918–1947. In general, each reference is accompanied by a lengthy abstract so informative at times as to give even minute details, including long tables; on the other hand, some references have no annotations whatsoever.

Compiled as it is, largely from various abstracting services, the titles of the source-journals or proceedings are given in abbreviated forms. It may be necessary at times for users to consult the appropriate lists of title-abbreviations that will explain them, such as the *Journals Abstracted in "Metallurgical Abstracts"* and *List of Periodicals Abstracted by Chemical Abstracts*.

Some errors have crept in, of which we list the more serious:

Item	Part reading:	Should read:
7	Met. Abs. 1,167(1934)	Met. Abs. 2,167(1935)
13	" " 2,353(1934)	" " 1,353(1934)
19	" " 3,554(1936)	" " 2,388(1935)
41	Trans. Electrochem. Soc. 75, 203(1939)	Trans. Electrochem. Soc. 75,201-6; discussion, 206-8(1939)
58	Aluminium, 24,106(1942)*	Aluminium, 24,106-110(1942)

* The original of this appeared in *Motortechnische Zeitschrift*, 3, 409–12 (1941). Cf. *Chem. Abs.*, 37, 3387 (1943).

There is a brief but good subject index at the end; there is no author index; neither is there any mention of references or bibliographies in the articles reviewed.

At this time, it is of interest to note Samuel Heiman's "Deposition of Metals on Aluminum by Immersion from Solutions Containing Fluorides" in the May 1949 issue of the JOURNAL. Although he lists 58 references, he makes no mention of the work under review.

EMORY C. SKARSHAUG

TIN: ITS MINING, PRODUCTION, TECHNOLOGY AND APPLICATIONS, American Chemical Society Monograph, Second Edition, by C. L. Mantell. Published by Reinhold Publishing Corporation, New York, 1949. 573 pages, $10.

The second edition of Dr. Mantell's Monograph on tin, much larger than the first, has been almost completely revised to include developments published since 1928. These include the Longhorn Smelter, electrolytic tin plate, war-emergency alloys, and other wartime conservation developments.

In this day of specialization, it is remarkable that one man should have a grasp of the various technologies ranging from the mining of tin ore to that of various specialized uses for tin alloys. The author has made contributions all along the line and it is fitting that he should revise his earlier Monograph because it is a job which otherwise would have required a board of experts.

The book has some deficiencies, which are largely due to the huge job which the Monograph presents to a single author. Various tables and graphs have inadequate definition of units. In some fields of processing, work parallel to that of Dr. Mantell has been neglected; for example, the work on low-temperature reduction and the subsequent electrowinning of tin. In general, however, the author has not used his editorial privilege of evaluating work of other investigators. The worthwhile in places is diluted with the worthless.

The description of the Longhorn Smelter is based on, and still contains the errors of, a 1943 release, and does not describe the substantial progress made since that time. Apparently the author did not find it necessary to ask for more up-to-date information.

Nevertheless, this second edition contains more about tin than can be found in any other book.

JOHN DASHER

Announcements from Publishers

SURFACE ACTIVE AGENTS, THEIR CHEMISTRY AND TECHNOLOGY by Anthony M. Schwartz and James W. Perry. Published by Interscience Publishers, Inc., New York, 1949. 590 pages, $10.00

This book summarizes the achievements of the last three decades in developing a host of new surface active

agents. The different types of products are reviewed with particular attention to their laboratory synthesis, commercial production, and characteristic properties. Special attention has been directed to the numerous practical applications of surface active agents and to their useful effects—foaming, wetting, detergency, emulsification, spreading, etc. In order to provide background for a better understanding of the diverse practical applications and related effects, the fundamentals of the chemistry and physics of surface phenomena have been summarized separately.

Recent Publications of National Bureau of Standards

Copies of the following publications of the National Bureau of Standards may be obtained at listed prices from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Doubly Charged Ion Spectra in Mass Spectra of Hydrocarbons, Fred L. Mohler, Evelyn G. Bloom, Edmund J. Wells, Jr., Jonathan H. Lengel, and C. Edward Wise, 10 pp., 10 cents (RP1975)

A compilation of doubly charged ions in the mass spectra of 148 hydrocarbons has been made, based on mass spectra published in the American Petroleum Institute Catalog of Mass Spectral Data.

Volumetric Determination of Columbium, Howard B. Knowles and G. E. F. Lundell, 4 pp., 10 cents (RP1980)

Description of a procedure whereby columbium, in a sulfuric acid solution, is quantitatively reduced by amalgated zinc to the trivalent form and subsequently oxidized to the quinquovalent state.

Polarographic Limiting Currents, John Keenan Taylor, Roberta E. Smith, and Irvin L. Cooter, 9 pp., 10 cents (RP1978)

The results of experiments designed to determine the current-time relationship for the dropping-mercury electrode are presented.

A Spiral Contractometer for Measuring Stress in Electrodeposits, Abner Brenner and Seymour Senderoff, 16 pp., 10 cents (RP1953).

Description of an improved instrument for the measurement of stress in electrodeposits. Formulas for the calculation of stress are given, and sources of error and correction factors for them are discussed.

Absorption Spectra of Methane in the Near Infrared, Richard C. Nelson, Earle K. Plyler, and William S. Benedict, 7 pp., 10 cents (RP1944).

A grating spectrometer with a lead-sulfide cell for detector was used for measurement of the infrared absorption bands of methane in the region of 1.66 microns. Many lines of the P, Q, and R branches of the 1.66 micron band were observed.

Study of the Modifications of Manganese Dioxide, Howard F. McMurdie and Esther Golovato, 12 pp., 10 cents (RP1941).

A study of the crystalline modifications of manganese dioxide, including a review of past work on this subject of interest in dry-cell manufacture.

Employment Situation

Please address replies to box shown, c/o The Electrochemical Society, Inc. 235 W. 102nd St., New York 25, N. Y

Position Wanted

ELECTROMETALLURGIST, production and development. B.S. in electrochemical engineering, M.S. in metallurgy. Four years production and development experience in the electrolytic reduction of aluminum; one year, lithium; one year, sodium. *Reply to Box 333.*

Recent Patents

Selected for electrochemists by Fred. W. Dodson, Chairman of the Patent Committee, from the Official Gazette

June 14, 1949

Lighton, L. E., 2,472,852, Filling and Venting Structure for Storage Batteries.

Wilkes, D. P., 2,472,930, Electrical Heating Unit.

de W. Erasmus, H., 2,473,020, Ferrochromium.

Koopman, K. H., 2,473,028, Copper Base Alloy.

Hunsicker, H. Y., and Kempf, L. W., 2,473,059, Bearing Alloy.

Hunsicker, H. Y., and Kempf, L. W., 2,473,060, Bearing Alloys.

Grene, G. H. S., 2,473,095, Tilting Salt Bath Furnace.

McBee, E. T., and Devaney, L. W., 2,473,161, Propane Chlorination.

McBee, E. T., and Devaney, L. W., 2,473,162, Liquid Phase Chlorination.
McCoy, E. H., 2,473,163, Plating Nickel on Aluminum.
Clark, F. M., 2,473,242, Heat-Resisting Capacitor.
Millard, G. E., 2,473,290, Apparatus for Plating Journals of Crankshafts.
Tama, Manuel, Tama, Mario, and Hoff, J. L., 2,473,311, Method for Producing Metal Alloys in a Submerged Resistor Type Induction Furnace.
Bright, O. S., Jr., 2,473,358, Cathode Coating for Electron Discharge Devices.

June 21, 1949

Ruben, S., 2,473,546, Alkaline Primary Cell.
Spencer, P. L., 2,473,550, Directly Heated Cathode.
Wickizer, G. S., and Brown, E. N., 2,473,627, Thermocouple with Radiating Fins.
Found, C. G., and Winninghoff, W. J., 2,473,642, Low-Pressure Electric Discharge Device.
Hansen, G. M., 2,473,681, Process of Breaking up the Charge in Electric Smelting Furnaces.
Benioff, H., 2,473,779, Pickup Loop with Thermocouple.
Hein, C. C., 2,473,884, Contact Means.
Jordan, P. B., and Pipkin, M., 2,473,888, Lead-In Wire for Electric Lamps and Similar Devices.
Penon, R., and Lemaigre-Voreaux, P., 2,473,900, Electrode Coating Process.
Stoltz, G. E., and Erbe, J. R., 2,473,918, Control System for Electrolytic Processes.
Turner, D. R., 2,473,923, Electrolytic Polishing Process.
Kröger, F. A., 2,473,960, Silicate-Titanate Phosphors.
Davignon, E. H., 2,474,038, Composite Metal.
Davignon, E. H., 2,474,039, Method of Forming Composite Metal Having a Nickel-Plated Beryllium-Copper Base and Gold or Silver Bonded Thereto by a Copper-Plated Iron Sheet.
Chubb, M. F., 2,474,091, Machine for Processing Storage Battery Plates.
Liger, A. W., 2,474,092, Composition for and Method of Electrodeposition of Lead.
De Long, H. K., 2,474,181, Anodic Coating of Magnesium.
Schulman, J. H., 2,474,193, Calcium Silicate Phosphor.

June 28, 1949

Tama, M., and Hoff, J. L., 2,474,443, Drum Type Induction Furnace.
Ellis, W. C., La Forge, L. H., Jr., and White, A. H., 2,474,473, Ballast Lamp.
Suchy, C. T., 2,474,502, Metallization of Electrically Non-Conductive Fabrics, Fibrous Materials, and Porous Materials.
Wood, E. J., 2,474,506, Method of Making Phosphor Materials.
Holden, A. F., 2,474,674, Salt Bath for Treating Stainless Steel Products.
Beechlyn, J. T., 2,474,716, Salt-Water Battery.

July 5, 1949

Abbott, J. G., 2,474,809, Dry-Plate Rectifier Unit.
Kleiman, M., 2,474,849, Production of Organic Disulfides.
Liebson, S. H., 2,474,851, Bromine Counter.
Addink, N. W. H., and Hekelaar, M., 2,474,966, Method of Preparing Selenium.
Rock, A. F., 2,475,152, Flat Dry Cell Battery Unit.
Rock, A. F., 2,475,153, Method of Making a Dry Cell Battery Unit of Flat Cells.
Schumacher, J. C., 2,475,157, Electrolytic Apparatus.
Kamlet, J., 2,475,186, Method of Protecting Metallic Surfaces Against Tarnishing and Corrosion.
Hall, H. J., and Jonach, F. L., 2,475,238, Reference Junction for Thermocouple Leads.
Clark, F. M., 2,475,310, High-Frequency Electric Capacitor.
Levy, G., 2,475,330, Luminescent Screen.
Tinkham, M., and Harris, D. G., 2,475,362, Electronic Pilot Light Indicator for Molten Steel Temperature.
Van Squires, D., 2,475,415, Cable Connector for Storage Batteries etc.
Jouannet, R., 2,475,452, Method of Readjusting the Current Supplying and Supporting Metal Rods of Continuous Self-Baking Electrodes.
Baird, F. T., 2,475,538, Storage Battery with Refractory Separator.
Christen, V. H., 2,475,543, Storage Battery Filler Support.

July 12, 1949

Bartlett, K. M., 2,475,586, Method of Electropolishing the Internal Surface of a Hollow Valve.

Verwey, E. J. W., Haayman, P. W., and Bol, A., 2,475,864, Electric Resistance Element.
Clark, C. W., and Schloen, J. H., 2,475,944, Process for Protecting Ferrous Metal Surfaces by Coating and Dipping Solution for Use Therein.
Clark, C. W., and Collins, T. G., 2,475,945, Method of Chemically Coating Metallic Articles of Aluminum or Predominantly of Aluminum and Solution for Use Therein.
Clark, C. W., and Collins, T. G., 2,475,946, Method of Chemically Coating Metallic Articles of Aluminum or Predominantly of Aluminum and Solution for Use Therein.
Max, A. M., 2,475,974, Electrodeposition of Copper.
Bachle, C. F., 2,476,020, Strip-Type Thermocouple.
MacKenzie, K. W., 2,476,247, Electrical Precipitator.
MacKenzie, K. W., 2,476,248, Electrical Precipitator.

July 19, 1949

Cox, G. C., 2,476,286, Marine Electrocleaning and Electropickling Apparatus.
Zavarella, A., 2,476,345, Process for Phosphating Stainless Steel Surfaces.
Evans, G. S., 2,476,590, Cathode Coating.
Fruth, H. F., 2,476,592, Cathodic Deposition Apparatus.
Morehead, C., 2,476,616, Low-Power Miniature Fluorescent and/or Glow Lamp.
Nicoll, F. H., 2,476,619, Cascade Phosphor Screen.
Wallhausen, C. W., Dooley, H. H., and Carroll, C. C., 2,476,644, Radioactive Metallic Foil Products.
Froelich, H. C., 2,476,654, Preparation of Alkaline Earth Fluorophosphate Phosphors by Coprecipitation.
McKreag, A. H., and Ranby, P. W., 2,476,676, Cadmium Phosphate Phosphors.
Overbeek, J. T. G., and Kröger, F. A., 2,476,681, Fluorescent Material and Electric Discharge Device.
Clini, D. J., 2,476,700, Aqueous Bath for Coloring Stainless Steel.
Gelardin, B., 2,476,722, Holding Device for Electric Dry Batteries.
Blackburn, W. E., 2,476,800, Rectifier.
O'Neil, T. A., 2,476,823, Method of Treating Polonium Plated Metal.
Penney, G. W., and Hewitt, G. W., 2,476,903, Electrostatic Dust Precipitator.
Rose, H. A., and Hopper, D. L., 2,476,916, Electric Resistance Vaccum Furnace.

July 26, 1949

Brenner, A., Seegmiller, R., and Riddell, G. E., 2,476,957, Process for Producing Films of Chromated Proteins on Zinc.
Martinet, J., and Deshays, M., 2,476,989, Selenium Rectifiers and Method of Manufacturing the Same.
Leverenz, H. W., 2,477,070, High Efficiency Blue-Emitting Zinc Cadmium Sulfo-Selenide Phosphor.
Moore, W. E., 2,477,077, Electrode Clamp.
Anderson, W. T., Jr., 2,477,279, Electrical Discharge Device.
McLean, E. R., and Jenkins, D. M., Jr., 2,477,310, Process and Composition for Producing a Dyeable Corrosion Resistant Surface on Zinc and High Zinc Alloys.
de Gier, J., and Smelt, J. A. M., 2,477,329, Cathode-Ray Tube.
de Lange, C., 2,477,364, Blocking-Layer Rectifier.
Herzog, C., 2,477,372, Electric Gaseous Discharge Lamp.

August 2, 1949

Holden, A. F., 2,477,561, Method of Heat-Treating Metal Parts with a Bright Finish.
Condit, P. C., 2,477,579, Electrolytic Process for the Production of Cyclohexadiene Dicarboxylic Acids.
Condit, P. C., 2,477,580, Electrolytic Process of Preparing Cyclohexadiene Dicarboxylic Acids.

The 97th Meeting of the Electrochemical Society
will be held at the
Statler Hotel, Cleveland, Ohio
April 19, 20, and 22, 1950

A Rose By Any Other Name

In 1952 our Society celebrates the semicentennial of its founding. It was on November 1, 1901, that a small group of men, full of vision and imagination, met at Philadelphia to consider organizing a society for the "advancement of the theory and practice of Electrochemistry." A few months later, in the same fair city, on April 3, 1902, the organization proceedings materialized and the first convention was held, with J. W. Richards of Lehigh University as president. It was but a year afterward that this young vigorous society, hardly upon the scene, was to send congratulations to the old world on the occasion of the founding of its sister organization, the Faraday Society.

Much water has flowed over the dam since that time. J. J. Thomson had then newly announced discovery of the electron through his study of partially evacuated glass tubes. Today, devices such as the fluorescent lamp, radio, and television remind us unceasingly that the electron in similar evacuated spaces is now well harnessed, and hardly needs an introduction to anyone. The Society has kept pace with this rapid whirl of events by sponsoring an increasing number of Divisions, symposia, and publications to satisfy the various channels of electrochemical interest.

The founders decided that our Society should be called the "American Electrochemical Society." So it was called until 1930 when incorporation proceedings provided the opportunity to change the name to "The Electrochemical Society," connoting a steady growth outside as well as within this country's boundaries. The objectives as stated in the Constitution had already been broadened to include the "advancement of the theory and practice of Electrochemistry . . . *and allied subjects.*"

Presently, with still further extension and streamlining of the Society's activities, the suggestion has been made that perhaps the time has come to consider again the title by which we are known. "The Electrochemist" has been suggested for our new JOURNAL, which almost two years ago replaced the traditional individual preprints of papers. "Journal of Electrochemistry" is another suggestion. Some members, in line with a recent contributor to our "Letters to the Editor" section, believe that our broadened fields of interest merit a change to "The Willard Gibbs Society." This name honors the famous Yale scientist who, in addition to establishing the foundations of modern thermodynamics, contributed terse basic ideas to many of the physical sciences, including electrochemistry. Still others hold that our present name should be retained, bearing as it does the tradition of a half century's contribution to scientific and technical achievement.

Whatever changes come now or in the future, they must always assure a high level of performance and a continuing series of contributions by our Society to the world community of nations. In all that we do, we should ascertain that our Society is forthrightly associated with the very spearhead of scientific and technical progress, and that this remains the only tradition we are unwilling to surrender. Accomplishing this and advancing along such a path, the name that graces us, whatever it is, will be equally pleasing and universally approved.

Current Affairs

Washington-Baltimore Forms New Local Section

The long felt need for a local section in the Washington, D. C.—Baltimore, Maryland area has at last been fulfilled.

The Board of Directors, at its meeting on October 12th, approved the petition of some 51 members who are currently living in that area.

The officers of the new section are as follows:

Chairman: Paul L. Howard
Vice-Chairman: Abner Brenner
Secretary: J. C. White
Membership Committee: Leo Waldron, N. E. Promisel, James R. Tillman
Program Committee: Abner Brenner
Entertainment Committee: J. Putnam Marble
Advisors on Executive Committee: William Blum, George W. Vinal
Representatives on Local Section Advisory Committee: Reginald S. Dean, Marc Darrin.

The officers of this new local section are to be congratulated on the successful fulfillment of their plans, entailing, as it did, a good deal of time, energy, and organization. In addition, Dr. William C. Moore deserves a hearty vote of confidence for his labors on the Local Advisory Committee in promoting the formation of this new section.

New School Opens at Carnegie Tech

The new School of Industrial Administration, opened on an experimental basis in September, at Carnegie Institute of Technology, is the nation's first school of industrial administration.

The school was founded last winter by a six million dollar gift to Carnegie from the W. L. and May T. Mellon Foundation.

Dr. George Leland Bach, head of Carnegie's Economics Department, is Acting Dean of the new school, which starts with six specially selected students and seven professors. All of the students have received bachelor degrees from the undergraduate Department of Industrial Administration at Carnegie, and have had some experience in industry. Classes are to be of the seminar type, with extensive student-faculty consultation on project work.

The goal of the school will be to prepare men for ultimate management positions, chiefly in industry where an understanding of modern technology is important. In September 1950, the school will formally open its doors and will accept students from other colleges and from industry.

48th Convention of Deutschen Bunsen-Gesellschaft

According to information recently received, the Deutschen Bunsen-Gesellschaft held its 48th General Convention at Weisbaden, Germany, October 13th through 16th, 1949.

The main topic of the meeting was "Progress Reports on Important Special Topics in Physical Chemistry." The Editor in charge was Professor A. Euken of Göttingen. Some of the principal papers presented are listed below:

"Progress in the Field of Molecules" by G. V. Schulz, Mainz
"Polarographic Analysis and Related Topics" by M. von Stackelborg, Bonn
"Separation of Isotopes" by W. Groth, Hamburg
"Chemical Binding in Organic Molecules" by F. Santer and E. Wicke, Göttingen

Each of the above papers was supplemented by several others on similar topics. Additional subjects in physical chemistry were also discussed.

Fall Meeting of AIEE

The Fall General Meeting of the American Institute of Electrical Engineers was held at the Netherland Plaza Hotel, Cincinnati, Ohio, October 17th to 21st. The technical program embraced several sessions in each of the following groups of Institute activity: Communications, Industry, Science and Electronics, General Applications, and Power.

Section News

Midland Section

The Midland Section of The Electrochemical Society entered the 1949–1950 season with the following new staff of officers, elected at the last meeting of the Section in May of 1949:

Chairman: R. C. Kirk, Magnesium Laboratory, The Dow Chemical Company
Vice-Chairman: F. W. Koerker
Secretary-Treasurer: H. A. Robinson

The first meeting for the new season was held on November 8th when the members were addressed by Society President Dr. A. L. Ferguson of the University of Michigan. Dr. Ferguson's topic was "Polarization and Overvoltage," a subject on which he has conducted many researches and achieved outstanding recognition. The meeting was held at the Dow Auditorium, Midland, Michigan..

H. A. Robinson, *Secretary-Treasurer*

Pittsburgh Section

The Pittsburgh Section opened its new season with a joint meeting of the North East Region of the National Association of Corrosion Engineers, held in the Pittsburgh Room of the William Penn Hotel, on October 20, 1949.

An all-day program was scheduled with technical sessions in the morning and afternoon. On the agenda were papers on Aluminum in the Chemical Industry, Surface Treatment of Metals, Underground Corrosion, and Corrosion by Waters.

A dinner, following the technical sessions, was well attended by members of both societies.

Division News

Electrothermic Division

Plans for at least a full day's symposium, sponsored by the Electrothermic Division at the 1950 Spring Meeting in Cleveland, are well under way at this time, according to a recent communication from the Chairman.

The subject of the symposium is "The New Highly Refractory Compounds and Materials." The program committee, consisting of J. Glasser, Chairman, C. H. Chappell, and I. E. Campbell, have been in the process of soliciting papers, and to date there are about eight papers committed. Any person or organization wishing to contribute a paper in this new and timely field should contact Dr. Julian Glasser, Chairman, Electrothermic Division, The Electrochemical Society, Armour Research Foundation, 35 West 33rd Street, Chicago 16, Illinois.

* * *

Dr. I. E. Campbell of Battelle Memorial Institute was appointed Secretary-Treasurer of the Division by the Executive Committee, as of September 1st, succeeding Dr. A. E. Pavlish.

Personals

Robert F. Koenig, who has been with the Cleveland Research Division, Aluminum Research Laboratories, Aluminum Company of America, since his discharge from the Army, has accepted a position in the Knolls Atomic Power Laboratory, General Electric Company, Schenectady, New York.

Benedict L. Vondra, Jr., of Carson City, Colorado, has joined the faculty of the Malone Branch of Clarkson College of Technology, Potsdam, New York, as instructor in chemistry. Previously, Mr. Vondra had served on the Syracuse University faculty, and had been a research chemist at the University of Chicago under the Manhattan Project.

James P. Fugassi, Professor of Chemistry at Carnegie Institute of Technology, Pittsubrgh, Pennsylvania, has been appointed Acting Head of the Department of Chemistry, according to an announcement by President Robert E. Doherty. Dr. Fugassi joined the Carnegie staff in 1935.

E. K. McMahon, who has been working for his doctorate at Columbia University, New York, has accepted a position in the research department of the Tennessee Products and Chemical Corporation, Chattanooga, Tennessee.

M. K. T. Reikie has resigned his position as Superintendent of Research at Hudson Bay Mining & Smelting Co., Ltd., Flin Flon, Manitoba, to take up similar duties for the Tin Processing Corporation at the Longhorn Smelter in Texas City, Texas.

New Members

At the meeting of the Executive Committee held on September 13, 1949, at the office of The Electrochemical Society, Inc., 235 West 102nd Street, New York City, the following were elected to membership:

TARAPADA BANERJEE, c/o Librarian, National Metallurgical Laboratory, Jamshedpur, India (Electrodeposition and Electrothermic)

OSCAR A. BERTHOLD, The Berthold Company, mailing add: 90 Spring Valley Ave., Hackensack, New Jersey (Electodeposition)

GEORGE W. BODAMER, Rohm & Haas Co., 5000 Richmond St., Philadelphia, Pennsylvania (Electro-Organic)

ROBERT E. DUNHAM, Sunray Electric, Inc., Warren, Pennsylvania (Electronics)

JOSEPH B. HEITMAN, Nalley's, Inc., mailing add: 604 North Carr St., Tacoma, Washington (Industrial Electrolytic)

ERNEST L. MARTIN, University of New Mexico, Box 178, Albuquerque, New Mexico (Theoretical Electrochemistry, Corrosion, and Electrodeposition)

G. LLOYD MARTIN, Mallinckrodt Chemical Works, Second and Mallinckrodt Sts., St. Louis 7, Missouri (Electronics, Industrial Electrolytic, and Theoretical Electrochemistry)

ROBERT E. MALLONEE, National Carbon Co., mailing add: 3739 W. 179th St., Cleveland 11, Ohio (Corrosion)

CHARLES E. NELSON, Magnesium Laboratories, The Dow Chemical Co., Midland, Michigan (Theoretical Electrochemistry, Batteries, Corrosion, Electrodeposition, and Electrothermics)

KADAMBY SESHADRI, Council of Scientific & Industrial Research, mailing add: North End Hotel, Nalleswaram, Bangalore 3, S. India (Industrial Electrolytic and Theoretical Electrochemistry)

SEYMOUR J. SINDEBAND, American Electro Metal Corp., 320 Yonkers Ave., Yonkers, N. Y. (Theoretical Electrochemistry, Corrosion, Electrodeposition, and Electrothermics)

Reinstatements

G. B. BONINO, University of Bologna, Sede in Bologna, Italy (Theoretical Electrochemistry, Organic Electrochemistry, Corrosion, Alkali and Chlorine, and Dielectrics)

HANS M. CASSEL, Explosives Branch, Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pennsylvania (Theoretical Electrochemistry)

MILES PENNYBACKER, Voltarc Tubes, Inc., mailing add: 44 Cross St., Norwalk, Connecticut (Electronics)

Book Review

HYDROGEN IN METALS by Donald P. Smith. Published by University of Chicago Press, Chicago, Illinois, 1948. 366 pages, $10.00.

The behavior of hydrogen in metals is a typical example of a problem which is of great interest from the fundamental, scientific point of view, but also has practical, industrial aspects. Hydrogen has a profound influence on such properties of metals as mechanical strength, corrosion characteristics, etc., and, at the same time, presents fascinating problems related to the electronic structure of alloys, their crystal structures, and their imperfections. In his book on "Hydrogen in Metals," Professor Smith approaches this vast field of factual knowledge primarily from the phenomenological standpoint, although many theories are mentioned and discussed. In this way, the book provides both the practical and the theoretical man with a broad base for further research, which is much needed, particularly from the fundamental and theoretical point of view.

In the first few chapters, the author discusses extensively occlusion and the rates of solubility and permeability of hydrogen in massive metals and alloys, and illustrates the subject with a large collection of graphs and tables. Certain other aspects of the role of hydrogen, such as catalysis and other surface phenomena, are purposely left out. A particular stress is placed on the presence of lattice cracks which, according to the author, in many instances play a basic role in the behavior of hydrogen in metals. Endothermic and exothermic occluders are treated separately, and a special chapter is devoted to the palladium-hydrogen system. Electrical conductivity, electrode potential, and overstepping phenomena in the same system are the subject of two subsequent chapters. Further chapters deal with anomalous and nonoccluding metals and with ferrous alloys. The magnetic properties of alloys containing hydrogen, which are interesting from both theoretical and

practical viewpoints, are treated in a separate chapter. A survey chapter concludes the regular text of the book, which is followed by fifty pages of supplementary notes containing a wealth of diverse material. A bibliography of nearly 1500 papers includes references also to such fields as the influence of hydrogen on photoelectric sensitivity, etc., which are not treated in detail in the book itself.

R. SMOLUCHOWSKI

Announcements from the Publishers

ORGANIC REACTIONS, Volume V; Roger Adams, Editor-in-Chief. Published by John Wiley & Sons, Inc., New York, 1949. 446 pages, $6.00.

Volume V of the Organic Reactions Series presents a thorough discussion of 10 important organic reactions. One chapter is devoted to each reaction and each chapter is written by a man who has had special experience with the reaction being discussed. The book meets the needs of chemists and chemical engineers for a complete critical evaluation of the best methods of synthesizing important compounds.

ADVANCED ORGANIC CHEMISTRY by G. W. Wheland. Published by John Wiley & Sons, Inc., New York, 1949. 799 pages, $8.00.

This is the new second edition of this book whose major theme is the structural theory considered in its broadest sense. The different aspects of this theory, which underlies the whole of organic chemistry, are discussed in the various chapters. A few chapters heading are: Addition Compounds, Modern Concepts of Acids and Bases, Structural Isomerism, Steroisomerism, The Configurations of Carbons, Strain Theory and Steric Hindrance, The Theory of Resonance, etc.

ADVANCES IN ELECTRONICS edited by L. Marton. Published by Academic Press, Inc., New York, 1949. 475 pages, $9.00.

This book is a yearly publication of articles devoted to the general field of electronics. It contains critical and integrated reviews of specific topics in physical electronics and engineering electonics. It is an excellent guide for the research worker who must keep abreast of advances and the latest developments in this field.

ULTRASONICS by Benson Carlin. Published by McGraw-Hill Book Co., Inc., New York, 1949. 264 pages, $5.00.

This book explains the vital theory of ultrasonics and points the way to its practical application. It discusses waves of dilation, waves of distortion, irrotational waves . . . the beam spread at various frequencies from a given transducer size, methods of experimental explanation of the ultrasonic energy in a beam; in general the theory, design techniques, and industrial uses of ultrasonics.

Employment Situations

Please address replies to box shown, c/o The Electrochemical Society, Inc., 235 W. 102nd St., New York 25, N. Y.

Position Available

ELECTROCHEMIST OR METALLURGIST: Recent college graduate, B. S. degree and under 30 years of age, with an interest in the field of corrosion and protective paints and coatings, wanted for position in Development and Research Department of large East Coast Shipyard. *Reply to Box A-215.*

Positions Wanted

ELECTROMETALLURGIST, production and development. B.S. in electrochemical engineering, M.S. in metallurgy. Four years production and development experience in the electrolytic reduction of aluminum; one year, lithium; one year, sodium. *Reply to Box 333.*

CHEMICAL ENGINEER, 34, for research or development, industrial or academic. Doctorate 1947, with background in physical, inorganic, organic chemistry, physics, and mathematics. Experienced in electrochemistry, metallurgy, corrosion, and administration. *Reply to Box 334.*

INORGANIC CHEMIST, Ph.D., 25 years' research, development with major companies; experienced in modern laboratory techniques, pilot plant design and operation; writing reports, surveys, patent studies, economic evaluations; knowledge of many fields of chemistry and science, literature, languages; high offices in professional organization. Desires responsible position in development research. *Reply to Box 335.*

Letter to the Editor

Dear Sir:

A current of electricity passing through a metallic conductor is essentially a stream of electrons. However, it is possible that the impressed potential may bring about a slow drift of positively charged metal ions in the direction opposite to the electron flow.

It has occurred to me, that if this latter supposition is true, there should be a difference in the concentrations of the isotopes Cu^{63} and Cu^{65}, at the ends of a copper wire which has been used for many years for carrying direct current. The easiest way to test this hypothesis would be to take samples from the ends of a trolley wire, seven or eight miles long, now in use on a direct current street car line, and determine the relative concentrations of these two copper isotopes in the respective samples. Possibly very accurate atomic weight determinations on these ends of this wire would achieve the same result.

Having no equipment for this kind of work, I am passing this idea along with the hope that some one who has the apparatus available will carry out the above suggested experiments.

WILLIAM CABLER MOORE
Stamford, Connecticut

Future Meetings of Other Organizations

Chemical Show, Grand Central Palace, New York City, November 28–December 3.

American Society of Refrigerating Engineers, annual meeting, Edgewater Beach Hotel, Chicago, Illinois, December 4–7.

American Society of Heating & Ventilating Engineers, annual meeting, Dallas, Texas, January 23–27.

American Institute of Electrical Engineers, Winter General Meeting, New York City, January 30–February 3.

Future Meetings of The Electrochemical Society

Cleveland, April 19-22, 1950

Buffalo, October 11-14, 1950

St. Louis, Spring, 1951

Detroit, Fall, 1951

Philadelphia, Spring, 1952

Montreal, Fall, 1952

Recent Patents

Selected for electrochemists by Fred. W. Dodson, Chairman of the Patent Committee, from the Official Gazette

Hanson, J. F., 2,477,601, Directly Heated Cathode.

McMorris, E. R., 2,477,759, Battery Corrosion Eliminator.

Talbot, W. F., and Buchdahl, R., 2,477,776, Printing Ink and Method of Using Same.

Jones, C. G., 2,477,808, Electrolytic Apparatus for Treatment of Moving Strip.

Plump, R. E., 2,478,008, Process of Producing a Solid Pentachloropropane.

Jolivet, H., 2,478,105, Iron Chromium Manganese Alloy.

Cass, O. W., 2,478,152, Preparation of Chloral and Chloral Hydrate.

August 9, 1949

Gerber, L. S., 2,478,186, Storage Battery Separator.

Gronningsaeter, A. M., 2,478,189, Production of Malleable and Annealable Nickel.

Atkinson, R. H., 2,478,225, Induction Melting of Palladium and Palladium Alloys.

Robinson, P., and Dorst, S. O., 2,478,322, Process for Producing Improved Electrical Conductors.

Graham, C. L., and Dietz, H. J., 2,478,387, Phosphorescent Materials.

Payson, P., 2,478,420, Steel for Plastic Mold Dies and Articles Made Therefrom.

Grebe, J. J., 2,478,478, Potential Gradient Anode for Galvanic Protection.

Grebe, J. J., 2,478,479, Cored Magnesium Anode in Galvanic Protection.

Lockwood, L. J., and Gongoll, V. F., 2,478,632, Spacer-Connector for Flat Dry Cells.

Hack, C. H., Behr, G. E., and Vahrenkamp, G. J., 2,478,692, Corrosion Resistant Coating for Ferrous Products.

Trantin, J., Jr., 2,478,723, Ferrous Base Alloy for Piercer Points.

Trantin, J., Jr., 2,478,724, Ferrous Base Alloy for Piercer Points.
Elder, J. A., Jr., 2,478, 755, Corrosion Inhibitors.
Elder, J. A., Jr., 2,478,756, Corrosion Inhibitors.
Williams, F. D., Jr., 2,478,798, Primary Cell Vent and Method of Making.
Wintermute, H. A., 2,478,800, Electrode Assembly.
Schmidt, G., 2,478,841, Cathode for Electric Discharge Tubes.
Nelson, C. G., 2,478,887, Cradle for Flat Batteries.

August 16, 1949

Morse, C. K., 2,478,934, Electric Apparatus for Separating Oils from Mixtures.
Tuttle, B. S., and Navoy, T., 2,478,954, Method of Treating Phosphate Coated Surfaces.
Froelich, H. C., 2,479,158, Magnesium Titanate Phosphor.
Inman, G. E., 2,479,164, Electric Glow Discharge Lamp.
Blackburn, W. E., and Apodaca, A. R., 2,479,301, Selenium Rectifier.
Bondley, R. J., 2,479,302, Method of Electropolishing Laminated Magnetic Cores.
Cook, W. G., 2,479,317, Control System.
Davis, J. V., 2,479,323, Plating Machine.
Snyder, E., 2,479,423, Method of and Materials for Treating Surfaces of Iron, Zinc, and Alloys of Each.
Wilson, E. D., 2,479,446, Method of Manufacturing Small Current Selenium Rectifiers.

August 23, 1949

Gilbert, L. O., 2,479,564, Phosphate Coating of Metallic Articles.
Anderson, E. A., and Jillson, D. C., 2,479,595, High Manganese Brass Alloys.
Anderson, E. A., and Jillson, D. C., 2,479,596, High Manganese Brass Alloys.
Chubb, M. F., and Hense, O. P., 2,479,603, Storage Battery Plate and Process for Making the Same.
Chester, A. E., and Reisinger, F. F., 2,479,670, Electroplating Baths and Method for the Electrodeposition of Zinc.
Wallhausen, C. W., Dooley, H. H., and Carroll, C. C., 2,479,882, Radioactive Metal Products and Method for Manufacturing.
Stewart, A., Pitrot, A. R., and Willihnganz, E., 2,479,983, Storage Battery Expander Material and Process for Preparing the Same.
Robinson, M. O. and Robinson, H. A. 2,480,087, Rapid-Wetting Gypsum-Base Backfill for Cathodic Protection.

August 30, 1949

Betzler, H. W., 2,480,113, Photocell Structure.
Driver, D. L. A., 2,480,124, Manufacture of Selenium Elements Such as Rectifiers.
Matson, A. E., and Trask, H. V., 2,480,156, Electrodeposition of Iron.
Schwartzwalder, K., Rulka, A. S., and Smith, R. W., 2,480,166, Resistor for Thermogauges.
Stassen, E. D., 2,480,202, Battery Holder.
Findley, H. J., and Beatty, R. D., 2,480,404, Portable Thermoelectric Generator.
Findley, H. J., 2,480,405, Thermoelectric Radio Operation.
Allen, V. O., 2,480,432, Nickel Alloy and Electrical Resistor Element Made Thereof.
Berg, C., and Berg, M., 2,480,437, Filling and Vent Valve.
Coates, G. E., 2,480,448, Protective Surface Treatment of Magnesium Base Alloys.
Grangette, L., 2,480,463, Automatic Control of Electric Arc Furnaces.
Johnson, A. F., 2,480,474, Method of Producing Aluminum.
Wilke, M. E., 2,480,531, Flat Type Dry Cell.
Cummins, H. S., 2,480,557, Detachable Thermocouple Housing.
Renzoni, L. S., 2,480,771, Process for the Electrolytic Recovery of Nickel.

September 6, 1949

Daniel, A. F., 2,480,839, Alkaline Primary Cell.
Frager, M., and Iserson, H., 2,480,845, Electrolytic Removal of Resin from Metal.
Jaworski, L. A., and Clutcher, J., 2,480,861, Battery Filling and Ventilating System.
Lewis, R. W., and Rowe, L. R., 2,480,941, Composite Receptacle for Flat Cells and Method of Making.
Randall, W., 2,480,964, Storage Battery Plate Connection.
Babayan, V. K., 2,481,188, Chlorination of Polyethylene.

(*Continued on page 76C*)

Technical Notes and Reviews

Symposium on the Physics of Powder Metallurgy

"Physics of Powder Metallurgy" was the subject of a three-day symposium sponsored by the Metallurgical Laboratories of Sylvania Electric Products Inc., at Sylvania Center, Bayside, N. Y., and held at the Post Theatre at nearby Fort Totten, August 24th to 26th, inclusive.

Outstanding American and European authorities met for the first time under commercial auspices to correlate recent advances in solid-state physics with engineering approaches to problems in powder metallurgy in order to promote a better understanding of the mechanisms of sintering. Twenty-three papers were presented, covering theories and mechanisms of sintering, self-diffusion, viscous flow, grain growth, nucleation, recrystallization, and surface tension. Also on the agenda were papers covering certain engineering aspects of powder metallurgy, sintering of special materials, and techniques of electron microscopy applied to these fields of endeavor.

Powder Metallurgy Research

In the opening address, E. Finley Carter, Vice-President in Charge of Engineering of Sylvania Electric Products Inc., pointed out the significance and scope of the symposium. A joint paper by Walter E. Kingston, Manager of the Sylvania Metallurgical Laboratories and Chairman of the symposium, and G. F. Heuttig, Head of the Department of Inorganic Chemistry of the University of Graz, Austria, keynoted the meeting with the observation that pure research into basic phenomena is a valuable aid to understanding the mechanism of sintering and the relation of the fabrication process to the properties of sintered materials. This paper, which surveyed the various phases of research in powder metallurgy, discussed a thermodynamic approach, methods of atom transport, kinetics of sintering, and the present state of the theory of sintering. The various stages of sintering were outlined, and emphasis was placed on the significance of changes in the compact occurring before densification. Geometric adjustments were cited to explain these changes, in which the contact area between particles increases from a point contact as the void surface area decreases. The study of surface energetics was shown to be a significant contribution to the understanding of the sintering process. It was also pointed out that, although there is still a divergence of opinion on some of the theoretical aspects of powder metallurgy, developments in recent years have served to provide a foundation for basic concepts.

Study of Crystal Growth

The papers on crystal growth, recrystallization, nucleation, and grain boundary movements sustained considerable interest, since the theory of sintering is concerned with the mechanisms of grain behavior. A new technique of studying crystal growth was described by A. Smekal, Head of the Department of Physics of the University of Darmstadt, Germany, who used crystals of rock salt as a model in his experiments. Since the growth of ionic crystals can be directly observed under microscopic examination and the new planes actually seen as they appear, NaCl crystals provide a convenient model for crystallographic studies of surface effects, rates of growth, and self-diffusion. Optical methods such as birefringence and infrared absorption can be used. Crystal lattice defects colored by the presence of metallic atoms can be directly observed, and single crystals can be uniformly and evenly deformed, and the rate of recrystallization can be quantitatively measured. Two distinct mechanisms of crystal growth were observed: (*a*) at low temperatures, growth was bounded by cube planes, but (*b*) at high temperatures there was no connection with crystallographic planes. The latter mechanism is the same as that occurring in metal crystals where the rate of growth is governed by the supply of the material. Smekal also showed how self-diffusion was

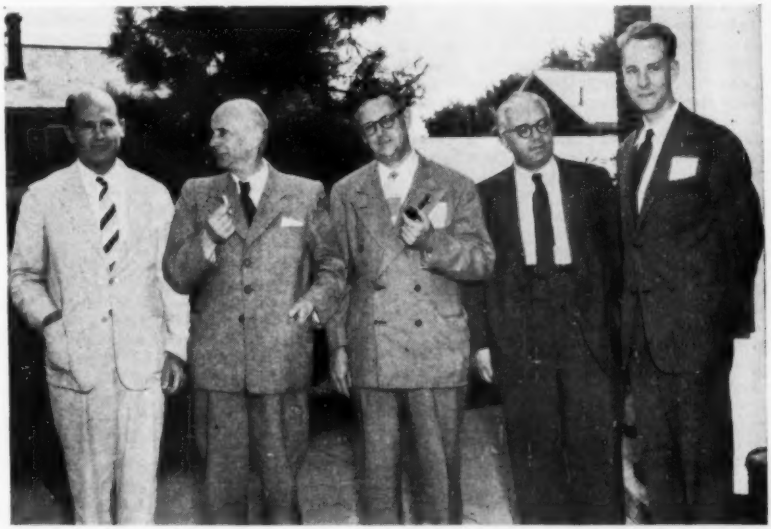
studied by means of electrical conductivity measurements and how these data were related to migration and "freezing" of holes in the crystal lattice. A comparison of the physics of ionic and metallic crystals showed the significance of these studies to the powder metallurgist.

Recrystallization

P. Beck, of the University of Notre Dame, presented a striking group of color photographs illustrating recrystallization and grain growth. The observed directions of boundary migration were discussed, and it was shown that grain growth is related to the orientation of nuclei. The relationship of grain orientation to diffusion at a given grain boundary was discussed in a paper by R. Smoluchowski and M. R. Achter of the Carnegie Institute of Technology. Data were presented on grain boundary diffusion of silver in copper. Rates of homogeneous nucleation and the effects of impurities and of the container wall were described in a paper by J. H. Hollomon and D. Turnbull of the General Electric Company. Considerations of changes in physical properties with recrystallization were presented by M. Balicki of the Polytechnic Institute of Brooklyn.

Liquid-Phase Processes

While most sintering processes are accomplished at temperatures near the melting points of the metals used, most of the detailed studies of the properties of metals have been performed at much lower temperatures. B. H. Alexander and G. C. Kuczynski of Sylvania Electric Products Inc. presented a paper describing an investigation of the characteristics of metals at high temperatures, under conditions of stress and dispersion that prevail during sintering. The possible types of flow mechanism which could lead to bonding of metallic particles were discussed, and it was shown from experimental results that volume diffusion flow is effective in bringing about a bond between copper particles up to 1070 C. In creep experiments on gold wire at 1050 C, the flow was found to be viscous at stresses lower than the critical value.



Among those who participated in the symposium were, left to right: Morris Cohen, Massachusetts Institute of Technology; G. F. Huettig, University of Graz, Austria; W. E. Kingston, chairman of the symposium and manager of Sylvania's metallurgical laboratories; Adolf Smekal, University of Darmstadt, Germany; and A. J. Shaler, Massachusetts Institute of Technology.

At higher stresses the flow first occurred by slipping, but became viscous at longer times.

Use of Radioactive Tracers

New techniques of the use of radioactive tracers in self-diffusion studies were described in a paper by M. Cohen, D. Bakalar, and F. S. Buffington, of the Massachusetts Institute of Technology. They presented data on the self-diffusion rates in alpha and gamma iron. The diffusion process in the sintering of copper-gold compacts was discussed in a paper by Pol Duwez and C. B. Jordan. The sintering of $AuCu_3$ was discussed in relation to the solubility of copper in the ordered and disordered phases of AuCu at the lower temperatures of the sintering process.

Surface Tension

A quantitative discussion of the laws by which surface tension and geometry determine the rates of plastic flow, evaporation and condensation, volume diffusion, and surface migration, was presented by Conyers Herring of Bell Telephone Laboratories. In the absence of externally applied stresses, the changes in shape of the welding together of small particles of a pure crystalline substance were assumed to be motivated by surface tension and effected by one or more of the above four processes. Methods were derived for computing volume diffusion currents by potential theory and for calculating the effect of grain boundaries on diffusion currents, allowance being made for possible anisotropy of surface tensions and grain boundary tensions. In addition, the relation of surface tension to stress was discussed. The mechanism of changes occurring in the density of powdered-metal compacts and experiments designed to reveal the kinetics of the process were described in a paper by A. W. Postlethwaite and A. J. Shaler of the Massachusetts Institute of Technology. Radiographic techniques were used to study the shrinkage of synthetic pores in massive copper.

Electrical Properties

Electrical properties as indicators of the degree of sintering were discussed in a paper by H. H. Hausner and J. H. Dedrick of Sylvania Electric Products Inc. A sintered material was represented as an electrical network and the total resistance shown to be a composite of parallel and series resistances. Measurements of the resistivity or its temperature coefficient were said to be more informative and more easily applied than other means, such as density measurements. The electrical properties were described as sensitive indications of changes occurring in the earliest stages of sintering, during which the other physical properties showed hardly any variation. Techniques were described for utilizing electrical resistance determinations in the study of various stages of sintering in vacuum and in reducing or protective atmospheres.

Liquid-Phase Sintering

Two papers were presented on the mechanism of sintering in the presence of a liquid phase. F. V. Lenel of Rensselaer Polytechnic Institute described the sintering of compacts made of 80 per cent iron powder and 20 per cent copper powder by weight. The compacts were sintered between the solidus and liquidus temperatures of the alloy system, where an appreciable amount of liquid was formed. The iron particles were slightly soluble in the liquid. The principal variables studied were the effect of particle size of the iron powder on the rate of densification and upon the rate of growth of the spherical iron particles in the microstructure of the alloy. The second paper, by R. Kieffer of Metallwerk Plansee, Austria, was read by S. J. Sindeband of American Electro Metal Corporation, and covered the sintering mechanism of carbide-binder compositions in the presence of a liquid phase. When compacts of tungsten carbide and cobalt powders were subjected to heat, the formation of skeletal bridges of carbide was disrupted during the sintering process and then reformed through precipitation. Density, hardness, and transverse strength were discussed in relation to the percentage of cobalt and to sintering time and temperature.

Properties of Tungsten Powder

An investigation of the properties of tungsten powder by reduction from its oxides was reported by B. Kopelman of Sylvania Electric Products Inc. The rates and mechanism of reduction of tungsten trioxide by hydrogen and the resultant alterations in the powder composition were described. Changes in apparent density of commercial tungsten powders was discussed. The dis-

tinguishing features of metal powder prepared by hydrogen reduction of its oxide were found to be (*a*) the presence of sintered agglomerates which behave essentially as single particles, and (*b*) the presence of pores of varying size depending on the time and temperature of sintering.

Titanium Carbide Powder

Production of pure titanium carbide powder by means of carbonizing gases was discussed in a paper by V. Fattinger of the University of Graz, Austria, read by J. L. Zambrow of Sylvania Electric Products Inc. The formation of very pure carbides was accomplished by reaction of titanium in either the solid or gaseous phase with carbonizing atmospheres. The techniques of preparing alloy powder products from fully alloyed powders were described by G. Comstock of Stevens Institute of Technology. Several methods of forming ferrous and nonferrous alloy powders were discussed and the use of these in sintered compacts was shown to give better homogeneity than powders of separate metallic components. Examples given of alloys prepared by this method were Co-Cr-Ni, Cu-Pb, brasses, bronzes, carbon and alloy steels, and special heat-resistant alloys. Hot and cold pressing procedures were described for alloy powders.

Pressing of Metal Powders

A survey of the principles and present status of hot pressing was presented by C. G. Goetzel of the Sintercast Corporation of America. The need for special equipments and improved techniques was stressed as being essential for future expansion of industrial production by hot press methods, which have been largely experimental to date. Complete densification has been demonstrated for parts made from copper, gold, brasses, bronzes, irons, steels, and cemented carbides. Hot pressing was shown to give a marked improvement in hardness compressive and tensile strengths, and ductility over conventional cold pressing methods. Problems of heat-pressure-time relationships and of heat-resistant die materials and lubricants were pointed out.

A study of the pressing of metal powders and of theories of pressing phenomena was presented by R. P. Seelig of the American Electro Metal Corporation. An analysis of the behavior of metal particles under pressure was made to show the influence of particle size and of die shapes. Rubber washer models were studied to show the movement of particles under various compacting conditions, providing a graphic demonstration of packing, deformation, and cold working. Effects of lubricants on resistivity of copper powder compacts were shown, and evidence was presented which supported a theory of sintering at room temperatures.

Electron Microscope Study of Grain Structures

A new technique of examining subgrain structures with the electron microscope was described in a paper by Laurence Delisle and G. A. Davis of Sylvania Electric Products Inc. Studies were made of tungsten specimens and single crystals of copper, and a series of electron photomicrographs clearly showed the sub-grain blocks. The sizes of the blocks and their degree of disorientation within the individual grains were of the same order of magnitude as the values calculated from x-ray results and those obtained by other techniques. The observations appeared to confirm and illustrate the existence of complex grain structures necessary to explain the physical behavior of metals. A paper by A. D. Power and I. Kakascik of the Radio Corporation of America described the use of the electron microscope for the evaluation of particle size and distribution for tungsten and molybdenum powders. The method was used to differentiate between powders used in wire manufacture as an indicator of those lots which would be satisfactory for production. The electron microscope technique was described as a means of correlating size distribution curves with production efficiencies, this correlation occurring for about 75 per cent of the lots tested.

Diffusion in Fluorescence

A paper on the role of diffusion in fluorescence was presented by K. H. Butler of Sylvania Electric Products Inc. Problems confronting the fluorescent engineer were discussed in regard to the formation and growth of crystals and the development of fluorescence in ionic phosphors. The case of the preparation of calcium halo phosphates was cited to show how the formation of crystals from reacting components was accompanied by interdiffusion of various ions. This diffusion progressed to the

stage where stoichiometric proportions were reached and a definite apatite structure was established. The composition-time-temperature dependence of particle growth was pointed out, and diffusion of activator ions into holes in the crystal lattice was shown to be related to the development of fluorescence.

Presiding at the various morning and afternoon sessions during the three-day symposium were the following technical chairmen:

F. V. LENEL—Rensselaer Polytechnic Institute
F. SEITZ—Carnegie Institute of Technology
S. SIEGEL—Westinghouse Electric Corporation
A. J. SHALER—Massachusetts Institute of Technology
M. COHEN—Massachusetts Institute of Technology
C. G. GOETZEL—Sintercast Corporation of America
B. S. ELLEFSON—Sylvania Electric Products Inc.

In general, the complete individual papers presented at the symposium are not available for distribution. However, all of the papers, together with the discussions, are being prepared for publication in book form next year.

Recent Patents

(*Continued from page 71C*)

Casey, H. M., 2,481,079, Method of Making Electrolytic Dendritic Powdered Iron.
De Long, H. K., and Barbian, H. A., 2,481,204, Magnesium Primary Cell.
Hindall, A. L., 2,481,218, Method of Curing Storage Battery Plates.
Gall, J. F., and Miller, H. C., 2,481,306, Electrochemical Polishing of Tantalum.
Reimert, L. J., and Fatzinger, E. A., 2,481,344, Fluorescent Zinc Oxide Pigments.
Hill, J. W., 2,481,424, Method of Producing Black Oxide Coated Steel Sheets.
McBroom, J. K., 2,481,433, Tilting Means for Electric Furnaces.

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Ruben, S., 2,481,539, Method of Making Depolarizer Units for Alkaline Primary Cells.
Appel, G. C., 2,481,558, Storage Battery with Notched Partition.
Dember, A. B., 2,481,728, Humidity Responsive Resistor.
Goodman, M., 2,481,739, Rectifiers.
Cox, G. C., 2,481,827, Electrode Terminal Connections for the Electrolysis of Seaport and Related Waters.
MacMahon, J. D., 2,481,854, Composition to Blacken Surfaces of Copper and of Alloys Containing Copper.
Cape, A. T., 2,481,976, Alloy.
Cinamon, L., 2,481,977, Metal Protective Coating Method.
Hanson, A. W., 2,482,062, Storage Battery Separator of Polystyrene Fiber.

September 20, 1949

Clarke, W. C., 2,482,096, Alloy and Method.
Clarke, W. C., 2,482,097, Alloy and Method.
Clarke, W. C., Jr., 2,482,098, Hardenable Iron Alloy.
Dolian, F. E., 2,482,104, Inhibited Phosphoric Acid Solution.
Hamister, V. C., 2,482,176, Electrode Connecting Pin.
Harris, R. A., and Patton, C. C., 2,482,178, Composite Structure for Forming a Seal with Glass.
Betz, P. L., 2,482,238, Gas Burner with Thermocouple.
Wernlund, C. J., 2,482,308, Catalyst Preparation.
Max, A. M., and Vance, C. M., 2,482,354, Copper Plating Solution.
Thomas, R. W., 2,482,382, Corrosion Resistant Alloy.
Malcolm, V. T., 2,482,423, Copper Base Alloy.
Turner, G., 2,482,445, Electric Resistance Furnace.
Wells, R. S., 2,482,450, Barium Halophosphate Phosphor.

The 97th Meeting of The Electrochemical Society
will be held at the
Statler Hotel, Cleveland, Ohio
April 19, 20, 21, and 22, 1950

Editorial

December 1949

A Plea for Natural Philosophers

Specialization is the trend of the times. We no longer have professors of natural philosophy—they were replaced years ago by professors of the physics of metals, or geochemistry, or neurosurgery. Radio pranksters have taken faint recognition of this trend by speaking of medical specialists who treat only the right nostril. But this joke, like many that have gone before, is not entirely empty. Chemists, for example, are methodically divided into organic, physical, and inorganic with the confident conviction that only these segments of the vast overall subject can be compressed within the dimensions of a single mind. But now subdivisions of these specialities are underway, with a disregard for their traditional sancity no less than the nucleonist shows for the once indivisible atom. Where specialization ends is a question that has no immediate answer.

It is understandable that amidst all this has come the cry for more integration. The intense narrow efforts of the specialist must be supplemented by the coordinating efforts of others who see clearly the broad panorama of their immediate branch of knowledge and also that of related and adjoining fields. For one reason, many rich areas for cultivation otherwise lie idle between the fences set up arbitrarily to subdivide science into its many compartments. Despite the convenience they afford, actually, of course, such compartments and boundaries neither exist today, nor do we expect them to exist in the future, except in the minds of men.

The field of natural philosophy, encompassing all of the physical, biological, and social sciences, and so well known to men like Benjamin Franklin, Thomas Jefferson, and Benjamin Thompson, is not dead as many would believe. It has only been stifled by the lack of comprehension and mild courage of modern scholars who are unduly awed by the magnitude of present-day affairs. The fact that natural philosophy these past 175 years has outdistanced the average mind is proof only that the challenge it throws out today is greater, but not impossible.

The world needs natural philosophers—in science, in business, in religion, and in government. For the major problems that face us today often require a broad outlook and a familarity not with a fraction of one field, but with *many* fields of knowledge. To cite an example, the statesman with a sensible background in science can better judge the problems posed by atomic fission, and trembles less, than the politician who has specialized in the narrow requirements of getting enough votes to be elected. Within our own boundaries, the able electrochemist who can handle problems of personnel is more valuable to his employer, one reason being that he can better handle himself.

Not all of us can be trained with a grasp of fields outside our own. Without doubt, the field of natural philosophy is a difficult assignment for even our most talented young men. Yet to them, and to the world, the reward is rich in providing a balanced farsighted vision in an era of epidemic nearsightedness.

Current Affairs

Chicago Convention in Review

A well-rounded technical program of over fifty papers highlighted the successful ninety-sixth meeting of the Society, held in Chicago, October 12th through 15th. More than three hundred members and guests met at the La Salle Hotel to participate in the functions of this interesting convention.

Following various committee meetings and a Board meeting on Wednesday, the convention opened formally on Thursday morning, October 13th. At this time, general chairman Clifford A. Hampel introduced President Alfred A. Ferguson, who welcomed those attending the first sessions.

Interesting technical symposia were sponsored by the Corrosion, Electrodeposition, and Electro-Organic Divisions of the Society. The Corrosion sessions on Thursday and Friday, offering an outstanding group of papers on inhibitors, were directed by Dr. Mars G. Fontana of Ohio State University. Dr. Ralph A. Schaefer presided at the Electrodeposition programs on Friday and Saturday, the practical papers on Saturday appealing to a large number of platers from the Chicago area. Drs. Clyde A. Crowley, C. L. Wilson, and H. R. Neumark led the Electro-Organic sessions on Thursday and Friday. A group of polarographic papers sponsored by this Division made this program attractive to many members.

Supplementing the symposia on Friday were well-attended round-table discussions sponsored by the Battery and Electro-Organic Divisions. The Battery Division held two round tables: Dr. J. N. Mrgudich directed a discussion of "The Structure of Manganese Dioxide," and Dr. Eugene Willihnganz presided at a discussion of "Low Temperature Performance of Storage Batteries." The members participating in the Electro-Organic round table discussed industrial electro-organic processes, economic evaluation of electro-

Chemical and Engineering News

PRESIDENT FERGUSON AND MRS. HAMPEL AT THURSDAY CONVENTION DINNER

Chemical and Engineering News

FRANK C. MATHERS (right) AND FRIEND AT CHICAGO MEETING

organic processes, and related technological matters.

A series of three luncheons attracted a high percentage of those attending the convention. On Thursday, Dr. Otto Eisenschiml, well-known Chicago chemist and author entertained the group with one of his yarns—the story of a chemist who used ingenuity to make a fortune.

The Friday luncheon featured the Joseph W. Richards Memorial Lecture presented by Mr. Oliver W. Storey. His subject, "Research in Industry—Is Government Antagonistic to It?," was received enthusiastically. The complete speech will be published in the JOURNAL early next year.

An Electrodeposition Division luncheon was held on Saturday. The honor guest at this time, Dr. Frank C. Mathers, gave an interesting talk on unusual things in electroplating, and Dr. Allen G. Gray, Editor-in-Chief of the second edition of "Modern Electroplating," gave a short report on the progress being made on this valuable book.

On Thursday night, members and guests enjoyed a social hour, steak dinner, varied entertainment, and dancing. Section "Q" met, following the dinner program and, as in the past, afforded a welcome chance for relaxation.

Plant trips, to the Armour Research Foundation, Lakeside Press of R. R. Donnelley & Sons Company, Chicago Electrotype Foundry, Western Electric Company, and extensive entertainment for the ladies completed the convention program.

Primarily responsible for the success of the meeting were the members of the Local Committee: Clifford A. Hampel, General Chairman; R. Scott Modjeska, Chairman of Arrangements; Ben F. Freeberg, Chairman of Registration; John B. Mullen, Chairman of Plant Trips; Jackson Burgess, Chairman of Finance; H. D. Douglas, Jr., Chairman of Entertainment; Mrs. C. A. Hampel, Chairman of the Ladies' Program.

Of much assistance in an advisory capacity were Clyde A. Crowley, L. G. Vande Bogart, and O. W. Storey.

Cleveland Convention Plans

From all indications, the ninety-seventh convention of the Society, to be held in Cleveland, Ohio, will offer one of the most complete technical programs in the Society's history. Papers are already being received, and many more are expected, for the scheduled symposia on Industrial Electrolytics, Electric Insulation, Electrothermics, Instrumentation, Luminescence, Rare Metals, and Theoretical Electrochemistry.

The meeting will be held on April 19, 20, 21, and 22, 1950, with headquarters at the Statler Hotel. In view of the large program, it is likely that technical sessions will begin on Wednesday, April 19th, instead of on Thursday as in the past.

Members in the Cleveland area who are making arrangements for the convention are:

Local Convention Committee
Honorary Chairman—G. W. Heise
General Chairman—L. R. Westbrook
Vice-Chairman—C. C. Rose
Sub-Committee Chairmen
Registration—L. Pucher
Hotel—N. M. Winslow
Finance—C. B. Sanborn
Trips—R. C. Hienton
Entertainment—C. E. Heil
Program—R. H. Schoenfeldt
Publicity—K. S. Willson

Working with the Local Committee are the officers and members of the Cleveland Section. Every effort is being made by this group to insure the success of the forthcoming convention.

Columbia to Expand Engineering School

Columbia University has taken steps toward the acquisition of additional property for the expansion of its School of Engineering, according to a recent announcement.

The property acquired includes seven plots of land bordered by 125th Street and Riverside Drive, and a building owned by Sheffield Farms Company is under consideration.

Felix E. Wormser, vice-president of the St. Joseph Lead Company and general chairman of the project, said that purchase of the 125th Street property represented the first step in a proposed $12,000,000 program for the School of Engineering. The long-term objective includes construction of a six-story laboratory building at a cost of $5,000,000 as the main unit of the research center and an additional minimum endowment of $7,000,000 for physical operation, research fellowships, scholarships, and a basic engineering program.

The reason for the contemplated expansion, according to Dean Finch, is the growth of the School of Engineering within recent years.

NBS Offers Physical Science Internships

Outstanding students in science and engineering are now offered excellent opportunities to broaden their undergraduate or graduate training through vacation-time employment and graduate fellowships offered by the National Bureau of Standards.

The Bureau has established an integrated work-study program, beginning at the college-sophomore level, for the selection and training of its research scientists and engineers. This program permits the student to alternate periods of full-time study with actual work experience in his chosen field, supplemented by on-the-job training and orientation courses at the Bureau. At the same time it enables the Bureau to select promising students, upon graduation, for permanent appointment to its staff and to provide them with opportunities for professional growth and advancement through further in-service training.

Notice to Authors

Plans are now being made for the spring convention of the Society, to be held in Cleveland, April 19–22, 1950. Symposia are being scheduled on Industrial Electrolytics, Electric Insulation, Electrothermics, Instrumentation, Luminescence, Rare Metals, and Theoretical Electrochemistry. To appear on this program, your abstracts or, preferably, complete manuscripts must be received *not later than* February 15, 1950. All material should be sent in triplicate to: The Editor, Journal of The Electrochemical Society, 235 West 102nd Street, New York 25, N. Y.

As the principal agency of the Federal Government for fundamental research, the National Bureau of Standards carries on a wide variety of projects ranging all the way from measurement of the magnetic moment of the proton to the development of new types of materials for prefabricated housing. This diversity of activity permits the student to choose work in his particular field of interest and to broaden his experience through contact with other related lines of work at the Bureau.

There are essentially three programs of interest to college and university students: the internship program for undergraduates, the regular training program for college graduates on the staff, and the fellowship program for graduates engaged in working for advanced degrees.

Information regarding qualifications for appointment may be obtained from the Personnel Division, National Bureau of Standards, Washington 25, D. C.

Edward Goodrich Acheson Medal and Prize

The Edward Goodrich Acheson Medal and Prize, founded September 17, 1928, is awarded to the person who, in the judgment of the Directors of the Society, determined by a vote of a majority thereof, shall have made such contribution to the advancement of any of the objects, purposes, or activities now or hereafter fostered or promoted by the Society or its successor to merit such award. Such contribution may consist of, but shall not be limited to, (*a*) a discovery pertaining to electrochemistry, electrometallurgy, or electrothermics; (*b*) an invention of a plan, process, or device, or research evidenced by a paper embodying information, useful, valuable, or significant in the theory or practice of electrochemistry, electrometallurgy, or electrothermics; and/or, (*c*) distinguished services rendered to the Society or its successor.

This award is to be made without distinction on account of sex, citizenship, race or residence.

The recommendation of a nominee for this Award is the responsibility of a committee of nine. This committee will consider nominations made both from the various committee members and from the membership at large and, therefore, any member desiring to place any name in nomination should send to Mr. A. F. G. Cadenhead, Director of Plant Research, Shawinigan Chemicals, Ltd., Shawinigan Falls, Quebec, Canada, the name of his candidate, accompanied by a full record of qualifications of the nominee. Supporting documents from friends of the candidate or from his organization shall be in order. However, it is the responsibility of the nominator to provide the Chairman of the Achêson Medal Award Committee with nine copies of the supporting documents (one copy for each member of the committee).

Correspondence Course in Electroplating

Joseph B. Kushner, Metal Finishing Engineer of New York and Stroudsburg, Pennsylvania, has announced that he is accepting enrollments in his personally conducted and supervised correspondence course in modern electroplating and metal finishing, "Electroplating Know How."

The course, based on many years' experience, is designed to give students the basic fundamentals of modern electroplating practice. It is fitted to meet the needs of plant executives seeking new ideas in the field, and chemists and metallurgists who want more practical information in the techniques of modern electroplating and metal finishing methods. The course may be taken informally as a reading and survey course or it may be taken formally for a certificate.

For complete details write Joseph B. Kushner, Metal Finishing Engineer, Stroudsburg 6, Pennsylvania.

Future Meetings of The Electrochemical Society

Cleveland, April 19–22, 1950
Buffalo, October 11–14, 1950
St. Louis, Spring, 1951
Detroit, Fall, 1951
Philadelphia, Spring, 1952
Montreal, Fall, 1952

Division News

Battery Division

Approximately 65 members of the Battery Division attended the annual business meeting held at the Chicago Convention on October 11th. C. C. Rose, Chairman, presided and reported on the year's activities and plans for the future. Of especial interest was the Secretary's report that membership in the Division had increased from 130 to 203 during the past year.

Chairman Rose announced that the next technical session on batteries is being scheduled for the 1950 fall meeting of the Society to be held in Buffalo. E. Willihnganz and J. N. Mrgudich will assist the Chairman in arranging the program.

The problem of modifying the by-laws of the Division to provide a two-year term for officers was discussed. The members present approved of this idea, and the Secretary-Treasurer of the Division was directed to prepare a revision of the by-laws to be sent out to the members early next year for approval.

The following slate of officers to hold office until October, 1950, was unanimously elected:

Chairman—C. C. Rose, Willard Storage Battery Company, Cleveland, Ohio.

Vice-Chairman—J. N. Mrgudich, Winchester Repeating, Arms Company, New Haven, Connecticut

Secretary-Treasurer—U. B. Thomas, Bell Telephone Laboratories, Murray Hill, New Jersey.

Members-at-large of the Executive Committee will be:

S. Eidensohn, Bureau of Ships, U. S. Navy, Washington, D. C.

W. S. Loose, Dow Chemical Company, Midland, Michigan

The business meeting was followed by two round-table discussions under the chairmanship of E. Willihnganz and J. N. Mrgudich. A report of these discussions will appear in a future issue of the JOURNAL.

U. B. THOMAS, *Secretary-Treasurer*

Section News

Cleveland Section

Dr. Karl S. Willson, of the Harshaw Chemical Company, addressed the members of the Cleveland Section at its opening meeting held October 6th at the Cleveland Engineering Society.

Choosing as his subject "Recent Developments in Electroplating," Dr. Willson briefly reviewed the growth, applications, and present importance of the electroplating industry. The speaker then discussed developments in high speed plating and bright plating. Smoothing effects in electrodeposits, whereby imperfections in the base metal are filled in preferentially, were discussed in some detail with particular reference to an easily buffed, semibright deposit, recently developed by the Harshaw Company, which possesses outstanding smoothing properties.

H. C. FROELICH, *Secretary*

Detroit Section

A new meeting place, the New Science Building, Wayne University, Detroit, was the scene, on October 21st, of the first fall meeting of the Detroit Section.

The speaker on this occasion, Mr. Hugh M. Archer, Research Engineer, The Detroit Edison Company, chose as his subject "Ultraviolet Radiation," discussing some of its recent advances and new applications.

Mr. Archer has been with The Detroit Edison Company since 1937 except for time spent in the U. S. Navy during the war. He is at present senior research engineer and his principal duties concern radiation measurements of all varieties. After the war he spent some time as Assistant to the Technical Director of the Atom Bomb Tests in Washington, D. C., and he was also present at the Bikini Tests.

In his talk, Mr. Archer discussed the various uses of ultraviolet radiation in science, industry, and medicine. In the field of medicine, the recent use of ultraviolet in the irradiation of blood plasma has greatly reduced the occurrence of reactions when pooled plasma is used. Vitamin A is also irradiated to increase its medicinal value. Ultraviolet radiation is also employed in air sanitation for the control of air-borne diseases in classrooms and hospitals.

Mr Archer also discussed the role of ultraviolet radiation in the processing of foods, stressing its ability to prevent mold contamination which frequently is a serious problem in food processing. The use of ultraviolet radiation in the raising of chickens has been very effective in controlling respiratory infections

which have always been a source of serious loss to chicken raisers. Ultraviolet radiation has recently been introduced into the cattle industry and seems to be effective in reducing barn odors and improving the general health of the cattle; however, such installations have not been in service for a sufficient length of time to permit definite conclusions to be drawn.

The speaker also demonstrated the use of the Cadmium Cell Meter to measure ultraviolet radiation and prevent overexposure to the rays. He concluded his interesting discussion with a demonstration of black light.

The program of future meetings of the Detroit Section follows:

January 6—Subject: Polarization; Speaker: Dr. Louis Weisberg, Consultant; Joint Meeting with the American Electroplaters' Society at the Statler Hotel

February 17—Subject: Alternating Current Electrolysis; Speaker: A. E. Remick, Professor of Organic Chemistry, Wayne University

March 17—Subject: Panel Discussion on Corrosion Testing; Speakers: To be announced

April 21—Subject: Television; Speaker: To be announced

May 19—Subject: Batteries; Speaker: To be announced.

MARGARET L. BATY, *Secretary-Treasurer*

HUGH M. ARCHER

WILLIAM C. GARDINER

New York Metropolitan Section

The Fall Meeting of the New York Metropolitan Section of The Electrochemical Society was held on October 26th at the Hotel Holley, New York City. Dr. William C. Gardiner, Research and Development Department, Mathieson Chemical Corporation, Niagara Falls, New York, addressed the meeting on the subject "The Mercury Cell for Chlorine and Caustic."

Dr. Gardiner was well qualified to speak on this subject as he has been associated with the development of mercury cells for producing chlorine and caustic soda at the Mathieson Chemical Corporation since 1932. At present he directs Mathieson's mercury cell development program and also the licensing of the mercury cell process.

Dr. Gardiner was born in Canada and while studying at Queens College his professor convinced him that power development on the St. Lawrence river would create a great demand for electrochemists. Accordingly he took his master's degree on an electroplating problem and continued his studies in electrochemistry at Princeton where he worked on the Weston Normal Cell. The latter resulted in his being the first recipient of the Society's Young Authors Prize in 1929.

From 1929 to 1932 Dr. Gardiner worked in chlorine metallurgy for Comstock and

Westcott, Inc., and after joining Mathieson in 1932, improved the Castner rocking cell to get a practical 10,000 ampere cell. This work was interrupted when Dr. Gardiner was assigned the problem of developing a cell to make electrolytic magnesium and chlorine using hydrated magnesium chloride feed. Such a cell was developed in a cooperative effort with Consolidated Mining and Smelting Company, at Trail, British Columbia.

After V-E Day, Dr. Gardiner led a team of seven engineers to Germany to study the chlorine plants there.

In his talk, Dr. Gardiner reviewed the development of mercury electrode cells, tracing the growth from their inception to new plants which have recently been put into operation in Canada. The findings of his European investigations were included in the discussion and were illustrated with a very complete set of lantern slides of photographs and design drawings of the German plants. Dr. Gardiner also discussed the theory of mercury cell operation, concluding with an up-to-date commentary on the economics of caustic production.

The meeting was well attended and the discussion continued well beyond the adjournment of the formal meeting.

L. I. GILBERTSON, *Chairman*

Pittsburgh Section

At a meeting of the Pittsburgh Section, the following officers were elected for the 1949–50 year:

Chairman—J. M. Bialosky, Research Laboratories, Carnegie-Illinois Steel Corporation

Vice-Chairman—G. C. English, Research Laboratories, Aluminum Company of America, New Kensington

Secretary-Treasurer—E. K. Camp, Westinghouse Research Laboratories, East Pittsburgh

A program committee meeting, held at Webster Hall, was also arranged by the Pittsburgh Section and attended by J. M. Bialosky, G. C. English, C. F. Pogacar, J. J. Curran, R. C. Stromquist, and E. K. Camp. At this session plans were made to mail a questionnaire to local section members in order that a program reaching the major interests of the majority of members could be devised. So that the fullest response may be obtained, any members in the Pittsburgh area who have not received this questionnaire are urged to contact the Section's Secretary.

ELDRIDGE K. CAMP, *Secretary-Treasurer*

Philadelphia Section

The first meeting of the Philadelphia Section of the Electrochemical Society was held on November 2, 1949, in Harrison Laboratory, University of Pennsylvania. A dinner at the Lenape Club in honor of the speaker, Dr. R. L. Hanson, of Bell Telephone Laboratories, preceded the meeting. Forty-four members and guests attended the dinner, and about 60 attended the meeting.

The subject of Dr. Hanson's address was "The Transistor—A New Semiconductor Amplifier." The transistor is a

R. L. HANSON

radically new type of electrical amplifier recently developed at Bell Telephone Laboratories, and although it is no larger than a small bean, it is capable of performing many of the functions of a vacuum tube and can do a number of things of which a vacuum tube is not capable. The transistor has no vacuum, it is not a tube, and it uses no filament—hence it consumes no filament power and requires no warm-up period before it can function. It is composed entirely of solid substances which operate at room temperature. The heart of the transistor is a tiny piece of semiconductor material, such as germanium or silicon, about the size of the head of a common pin. Two point contacts pressed against the surface of the semiconductor form two of the three terminals of the device with

the small cylindrical metal shell which houses the assembly forming the third terminal.

The interesting electrical characteristics of semiconductors such as selenium, germanium, silicon, boron, and several of the oxides have been the objects of research for many years and in spite of the lack of understanding of the causes of the electrical behavior of these materials by the start of the second world war, they had been built into many useful devices which were extensively used by the armed forces. Outstanding among these devices are the germanium and silicon point contact rectifiers which were used as detectors in radar systems.

Post-war research at Bell Laboratories has not only unraveled many of the mysteries of these point contact rectifiers, but has revealed the fact that the current through them can be modulated by means of potentials applied through added point contacts and that by this procedure, amplifiers with power gains of several hundredfold can be had.

By means of projected oscilloscope patterns, the speaker demonstrated several of the interesting characteristics of semiconductors and showed how a small positive potential applied through a second point contact on a germanium rectifier could alter the flow of current through the unit. It was explained that this effect resulted from the ability of the semiconductor to conduct electricity by means of positive charge carriers called "holes" in addition to the better-known negative carriers or free electrons. The added contact emits positive holes into the semiconductor, these holes are then drawn to the original contact by its negative potential, the space charge is altered, and the resistance of the contact is lowered. The added contact which emits the holes, hence its name "emittor," can thus be used as a trigger, like the grid of a vacuum tube, to release energy from a d–c supply to give an amplified version of the input signal. This is the transistor.

The performance of the transistor as a generator of a–c signals was demonstrated by operating a loud speaker from an oscillator circuit employing a single transistor powered by one battery. Amplification capabilities were shown by the insertion of a one-stage transistor amplifier between the oscillator and loud speaker.

To show that transistors are LOT limited in their application to the audio frequency range, a complete superheterodyne broadcast receiver operating without benefit of vacuum tubes was demonstrated. Radio, intermediate, and audio frequency amplification was accomplished by transistors. A transistor was used for the intermediate frequency oscillator and germanium point contact rectifiers were used as detectors. A selenium rectifier was employed for the power supply. The ten-inch loud speaker which was driven by two transistors in push pull gave sufficient output to establish a reasonable listening level over the entire auditorium.

In closing, Dr. Hanson emphasized the fact that transistors are still in the experimental stage and that much remains to be done before commercial applications can be made. Eventually, they may replace some of the vacuum tubes in electronic circuits. It cannot be predicted to what extent such a replacement may take place. Perhaps a more important part will be played by transistors in performing functions of which vacuum tubes are incapable. We have in the transistor an entirely new tool and time alone will reveal the full significance.

San Francisco Section

The first meeting of the San Francisco Section for the 1949–50 season was held at the St. Julien Restaurant, San Francisco, on October 5th. Members and guests attended dinner, following which was a business meeting and technical program.

The business meeting included a discussion of the program for the coming season, the type of meetings desired, and meeting dates. This discussion was very lively and the well-expressed opinions of the members gave promise of an interesting season.

The technical program consisted of a sound film in Technicolor produced by the National Carbon Company, Inc., entitled "Carbon and Graphite Electrodes." The film was very well received and enjoyed by all present. Following its presentation Mr. R. L. Baldwin, who was largely responsible for the production of the film, commented upon the experiences encountered in the actual shooting of the film and recording of the sound track.

RICHARD F. BECHTOLD,
Secretary-Treasurer

Personals

JOSEPH B. HEITMAN, formerly with Nalley's, Inc., in Tacoma, Washington, has returned to the University of Washington to pursue studies leading to the degree of Master of Science in Chemical Engineering.

HUGO A. BARBIAN has been transferred from the Western Cartridge Company of East Alton, Illinois to the Battery Research and Development Division of Olin Industries, Inc., located at the Winchester Repeating Arms Company of New Haven, Connecticut.

ALVIN GLASSNER, formerly in the Chemistry Department of Trinity College, Hartford, Connecticut, has accepted a position at Reaction Motors, Inc., Dover, New Jersey. Mr. Glassner's work is concerned with theoretical investigation of the performance of rocket motors.

New Members

At the meeting of the Board of Directors held on October 12, 1949, at the La Salle Hotel, Chicago, the following were elected to membership:

JOE M. ANDERSON, Southern Alkali Corporation, mailing add: P.O. Box 900, Lake Charles, Louisiana (Industrial Electrolytic)

JOSEPH W. CEPON, mailing add: 1115 Park Avenue, North Chicago, Illinois (Industrial Electrolytic)

HAROLD C. HAFNER, Bausch and Lomb Optical Co., Rochester, New York (Corrosion, Electrodeposition, Electro-Organic, Electrothermic, and Theoretical Electrochemistry)

KIZHAKKE G. HRISHIKESAN, Research Student, Columbia University, mailing add: 500 Riverside Drive, New York, N. Y. (Electrodeposition, Electrothermic, and Industrial Electrolytic)

WERNER JACOBSON, Continental Soap Corporation, mailing add: 334 South Mozart Street, Chicago 12, Illinois (Electro-Organic)

LALLUBHAI C. JARIWALA, Solar Batteries & Flashlights Ltd., 16 Custom House Road, Fort, Bombay, India (Battery and Electrodeposition)

BRUNO LEONELLI, Promat Division, Poor & Company, mailing add: 238 Rhode Island Avenue, Highland Park 3, Michigan (Electrodeposition)

JULIAN W. NASH, Battelle Memorial Institute, 505 King Avenue, Columbus 1, Ohio (Organic Electrochemistry, Corrosion, and Electrodeposition)

Employment Situations

Please address replies to box shown, c/o The Electrochemical Society, Inc., 235 W. 102nd St., New York 25, N. Y.

Positions Available

ELECTROCHEMIST OR METALLURGIST: Recent college graduate, B. S. degree and under 30 years of age, with an interest in the field of corrosion and protective paints and coatings, wanted for position in Development and Research Department of large East Coast Shipyard. *Reply to Box A-215.*

PHYSICAL CHEMIST, Ph.D. for work in a new corrosion laboratory of a large petroleum refiner in the Middle West. Exceptional opportunity for a man with good training and some experience in the field of corrosion. *Reply to Box A-216.*

Positions Wanted

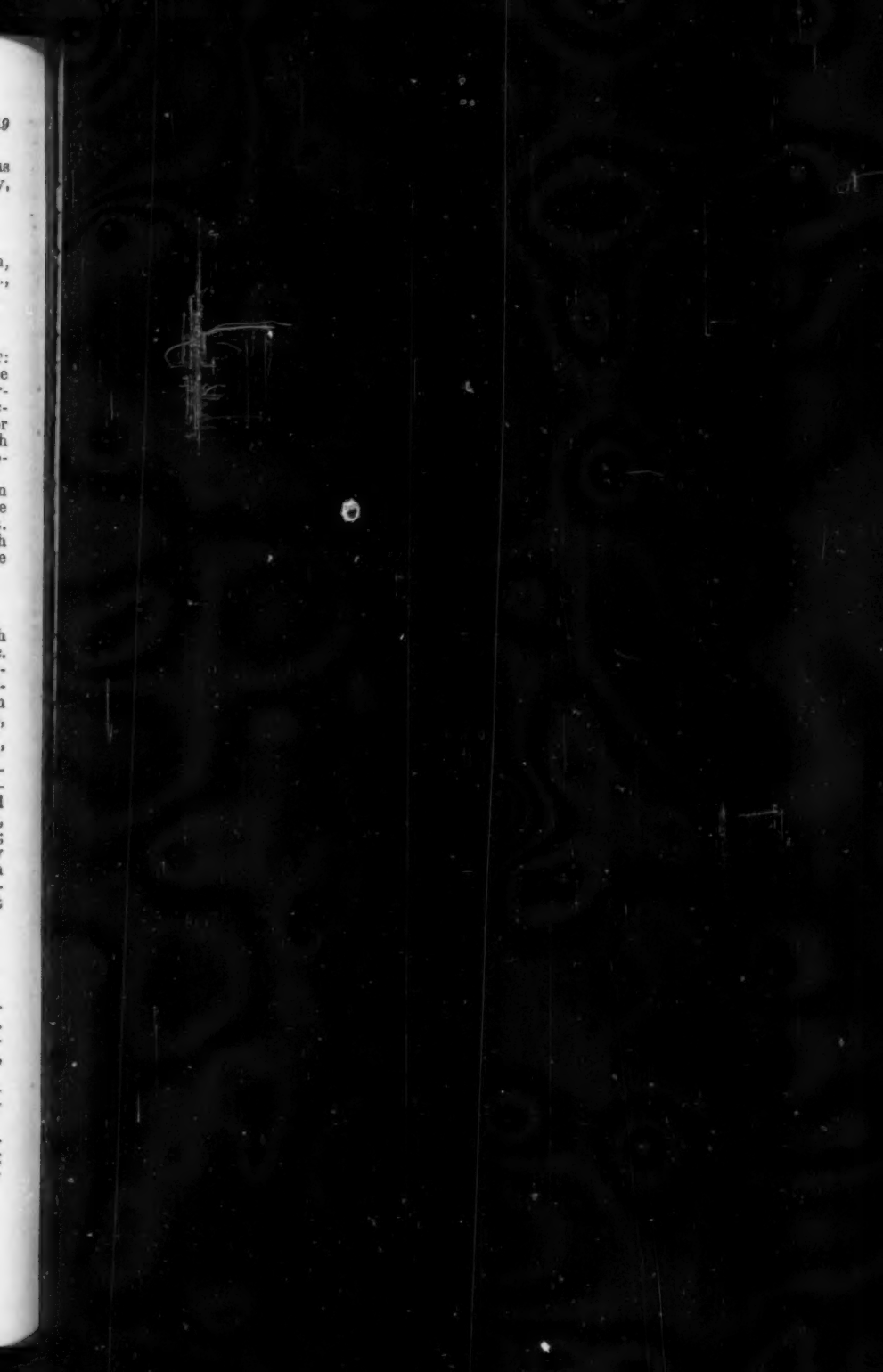
CHEMICAL ENGINEER, 34, for research or development, industrial or academic. Doctorate 1947, with background in physical, inorganic, organic chemistry, physics, and mathematics. Experienced in electrochemistry, metallurgy, corrosion, and administration. *Reply to Box 334.*

INORGANIC CHEMIST, Ph.D., 25 years' research, development with major companies; experienced in modern laboratory techniques, pilot plant design and operation; writing reports, surveys, patent studies, economic evaluations; knowledge of many fields of chemistry and science, literature, languages; high offices in professional organization. Desires responsible position in development research. *Reply to Box 335.*

Future Meetings of Other Organizations

PLANT MAINTENANCE SHOW AND CONFERENCE, Cleveland, Ohio, Jan. 16–19.

AMERICAN SOCIETY OF HEATING & VENTILATING ENGINEERS, annual meeting, Dallas, Texas, Jan. 23–27.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, winter general meeting, New York City, Jan. 30–Feb. 3.

AMERICAN SOCIETY FOR TESTING MATERIALS, committee week and spring meeting, Hotel William Penn, Pittsburgh, Pa., Feb. 27–Mar. 3.